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A PROPOSED TEST METHOD FOR DETERMINING THE EFFECT OF SIZES ON GLASS FIBERS FOR REINFORCED PLASTIC LAMINATES

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Scope

There is a wide interest in the use of glass fiber roving as a filler for reinforced plastic laminates. Until recently glass roving was made from glass filaments protected with two general classes of sizes. One was an inferior product known as a starch size and not readily adaptable to the production of high-quality plastic laminate use. The other was a methacrylato-chrome complex size yielding a roving with improved properties as compared with the starch size.

Recently there has been made commercially available by Libbey-Owens-Ford Glass Company, Fiber Glass Division, a new glass roving size known as the Garan Size. This size imparts to reinforced plastic laminates superior dry strengths as well as very high retained wet strengths. In view of the existence of this variety of sizes which are available and new ones that may be in the stage of development, it is essential that some test method be made available to manufacturers of glass fibers and the users thereof to determine the merits of these sizes.

This paper presents a test method which has been developed by some members of the glass fiber industry. The apparatus is simply constructed and yields results which are readily reproducible. This test method is offered with the hope that all of the manufacturers of glass fibers will review it, evaluate it, and adopt it. While the test equipment may be easily constructed, it has been found, based on the experience of two companies, that the test and test specimens must be made with extreme care since carelessness at any point in the test procedure or in the preparation of the specimens will lead to erroneous results. Therefore, in this paper we are presenting the test method with the greatest possible detail to insure that comparable results will be obtained by any user.

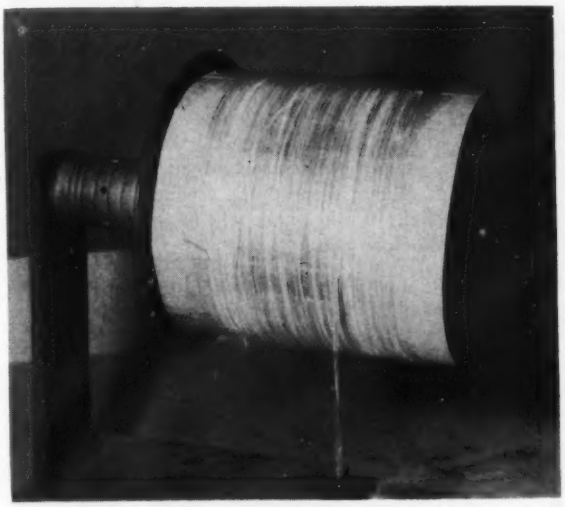

Fig. 1.

Definitions

To eliminate the possible confusion that may exist between the terminology "size" as used by some people and "finish" as used by others, we at this point will define the words "size" and "finish". A "size" is generally referred to as a surface treatment of the fibrous glass as it is formed at the bushing.* A "finish" is a surface treatment given to glass fibers after the fibers have been fabricated into strands, yarns, or woven fabrics.*

Test Method

Type of Test: To provide a strength evaluation of

A paper based on a talk given before the Eighth Annual Conference of the Society of the Plastics Industry.

* "Sizes for Glass Textiles for Reinforcing Polyester Plastics", by L. P. Biefeld and T. E. Philipps, Owens-Corning Fiberglas Corp., American Dyestuff Reporter, Vol. 41, pp. 501-506 (1952).

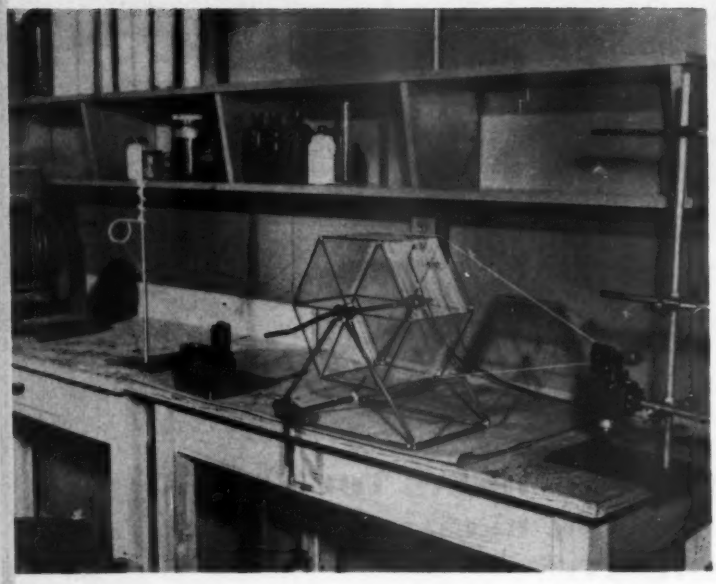

Fig. 2.

properties of glass fiber which may affect its use as a plastic reinforcing agent, the "fishing rod" test method is recommended.

Specimen: A cylindrical laminate or molding composed of parallel glass fibers bonded with resin approximately 0.110″ to 0.125″ diameter, 9″ long.

Resin content by ashing.....20–25%

Resin: Plaskon 911 or equivalent and 4% catalyst (Type ATC** or equivalent)

The glass portion will consist of 50 pieces of 6-end 140's roving. Where 6-end 140's are not available, the equivalent weight of other fiber will be used. Glass fiber must be dried before using.

Procedure: (1) Dry glass fiber by exposing when loosely arranged (not a textile package) in an oven at 150°F. for 10 minutes or more. (Fig. 1 shows type of package for drying.)

(2) Make a solution of resin and catalyst in acetone (U.S.P. Grade). While the solution concentration can be varied to control resin content of the treated fiber, generally an acetone solution having about 25% resin will be used to yield a test specimen having the stipulated

(*Continued on page* 390)

** Type ATC catalyst—a 50% benzoyl peroxide—50% tricresyl phosphate paste—is available from Lucidol Division, Novadel-Agene Corp., 1740 Military Road, Buffalo 5, New York.

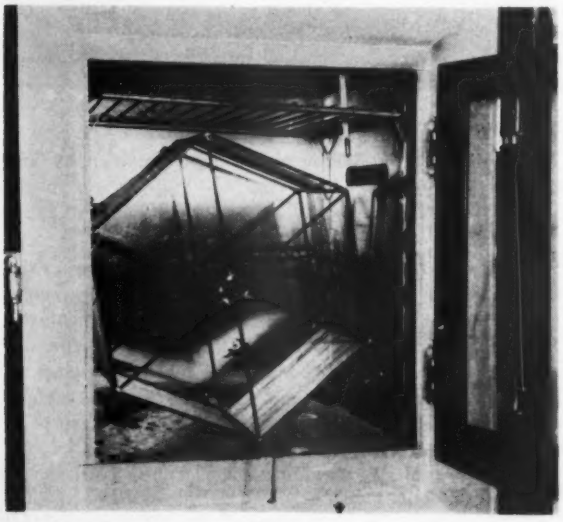

Fig. 3.

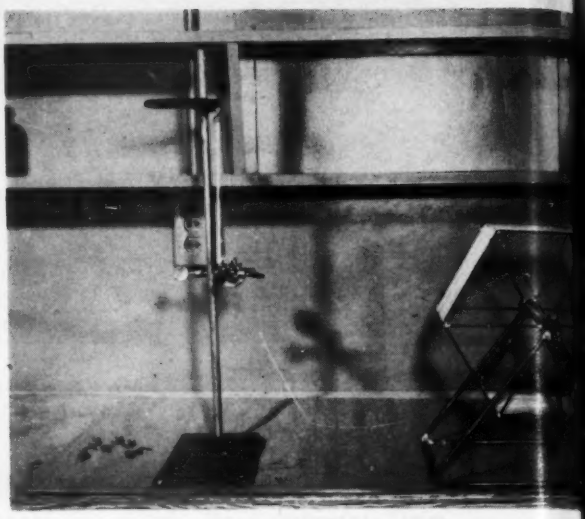

Fig. 4.

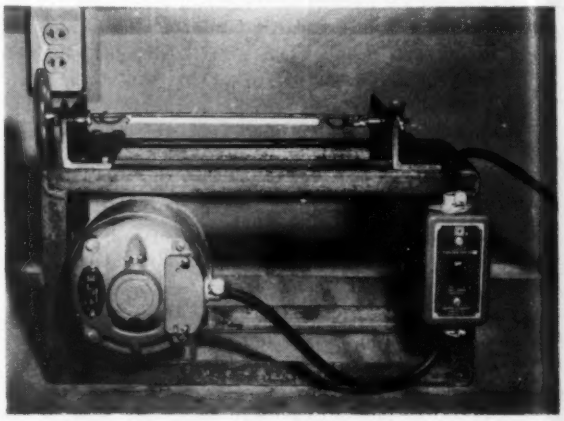

Fig. 5.

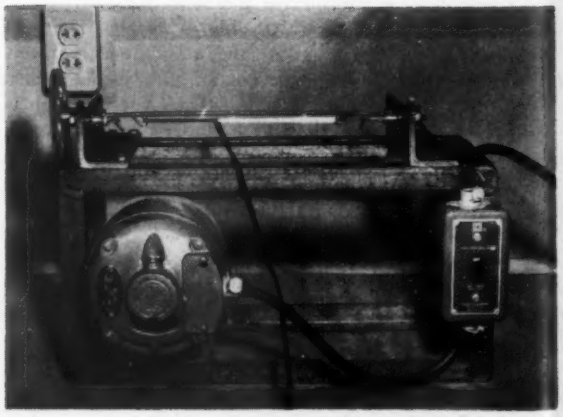

Fig. 6.

GLASS DIVISION CONFERENCE ON ANNEALING

The first conference to be held by a group of invited members of the Glass Division of the American Ceramic Society, with annealing as its topic, took place at State College, Pa., on June 8, under the chairmanship of Neil M. Brandt of Mellon Institute.

This first informal meeting on a specific phase of glass technology was inspired by Francis C. Flint of the Hazel-Atlas Glass Company and brought to fruition through the concerted efforts of Mr. Flint, Neil M. Brandt, and Norbert J. Kreidl of Bausch & Lomb Optical Company, recently elected Chairman of the Glass Division of the A.C.S.

At the conclusion of this unique meeting, where open discussion rather than lengthy papers was the order of the day, opinion among the assembled glassmen was unanimous that Neil Brandt had accomplished the almost impossible in successfully conducting a meeting devoted to several hours of free and open discussion with only very brief introductory remarks on the subject matter by selected discussion leaders.

Approximately fifty glass technologists attended this first invitation off-the-record conference. The major goals of this symposium were to summarize the problems that are encountered during the annealing procedure and to survey the theoretical developments that have resulted from the solution of many of those problems.

During the morning session, the problems common among and unique to each of the general types of glass industry—flat glass, hollow ware, and optical glass—were discussed. J. S. Gregorius, Pittsburgh Plate Glass Company, acted as discussion leader on the subject of flat glass. He described concisely the manufacturing conditions that led to the necessity of an annealing procedure and summarized the ideal annealing procedure for flat glass. In the forty minutes of open discussion which followed Mr. Gregorius' five-minute introductory remarks, the general principles of annealing for strain control were outlined and the problems particular to flat glass were covered in some detail.

C. L. Babcock, Owens-Illinois Glass Company, performed the task of discussion leader for the annealing problems encountered in the container industry. The discussion which followed also contributed to the flat glass and optical glass representatives' development of a better concept of the problems associated with annealing hollow ware. The whole annealing problem in this field is complicated by the complex geometry of containers.

H. R. Lillie, Corning Glass Works, as discussion leader on the subject of annealing optical glass, presented an excellent and concise picture of the requirements that are demanded of annealing procedure by optical glass. In the discussion which followed, the particular precision of properties characteristic of optical glass was re-emphasized. The influence of annealing, not only for strain control but also for stabilization of physical properties, was the point of contrast with annealing in the other two types of the industry.

In the afternoon session, the discussion centered about three aspects of the theoretical developments that have accompanied improvement in annealing procedure. H. L. Adams, Carnegie Institution of Washington, one of the founders of research in annealing glass, was paid tribute by J. S. Gregorius, on behalf of all of the technologists associated with glass manufacturing, for his pioneer work in the field of annealing glass. Dr. Adams proceeded to give a first-hand account of the background of the papers which appeared in 1919-1922. The discussion was a brief but thorough review of the physical approach to annealing in which glass is assumed to be functioning as a mechanical system, reacting to temperature gradient, during the growth and decay of strain.

The discussion period led by A. Q. Tool, retired, National Bureau of Standards, was actually concerned with the effect of heat treatment upon structure, although the term as such never entered the discussion. Dr. Tool cited much of the data concerning the effects of the stabilization process and of their interpretation. The use of stabilization processes for the control of physical properties and the relation of strain control annealing processes were briefly covered in the discussion.

E. A. Saibel, Carnegie Institute of Technology, leader of the discussion of the mathematical aspects of annealing theory, pointed out that the glass technologists might learn much from the metallurgists—not by borrowing from their theories but by profiting from the process of the evolution of their theories. In the lively discussion lead by Mr. Saibel, there were indications that the glass people realized that they have been, to some degree, buried in details and led into over-simplification of complex phenomena in attempts to formulate quantitative theory. The use of a satisfactory model which would be capable of mathematical analysis rather than endless curve-fitting of confusion fragmentary data appeared to offer a greater probability of success.

AMERICAN GLASS REVIEW PUBLISHER DIES

Julius Gustave Kaufmann, publisher of the *American Glass Review* and widely known in the glass industry for over 60 years, died June 3 at his Pittsburgh home at the age of 85 years. Death was caused by a heart condition from which he had suffered for several years.

His connection with the publishing field in the glass industry goes back to 1890 when he became bookkeeper for the *Commoner and Glass Worker,* by which the *Review* was first known. In 1942, Mr. Kaufmann became sole owner and President. His weekly trips to the factories, in search of news and advertising for the publication, continued until the early 1900's when the glass industry began moving from Pittsburgh to Indiana and other states where natural gas was avilable. Mr. Kaufmann was also publisher of *China, Glass and Decorative Accessories.*

He is survived by his widow, Mrs. Marie Berg Kaufmann, and a nephew, Attorney John H. Sorg of Pittsburgh.

• The Porcelain Enamel Institute will hold its 1953 Annual Meeting at The Greenbrier, White Sulphur Springs, West Virginia, on September 30, October 1 and 2, according to John C. Oliver, Institute Secretary.

ANCIENT KOPIA GLASS

By P. ROY and Y. P. VARSHNEY
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In an earlier paper[5] by one of the authors, the available authentic information regarding glass in ancient India was collected and summarized. Recently M. N. Nagar, Curator of the Provincial Museum at Lucknow, reported in the press the discovery of what is considered by him to be the site of an ancient glass factory near Kopia, a place about 31 miles from Basti in Uttar Pradesh.

The ancient name of Kopia is traced to be "Anupia" and it was perhaps the first place where Gautam Buddha stopped after he renounced the world and became a mendicant. According to the description of Nagar, the mound of Kopia is a large and conspicuous one extending about ¾ of a mile and rising about 40 ft. from the surrounding fields or about 60 ft. from the water level of the nearby Anoma river. The entire site is scattered over with bricks and brickbats similar to those reported by the Archaeological Survey of India at Taxila, Sarnath, Pataliputra, etc. Such bricks are believed to have been used for building construction during the Mauryan period. Towards the east of the mound at a distance of approximately a furlong lies an extensive flat land about 15 ft. above the surrounding fields. This tableland is stated by Nagar to be the site of an ancient glass factory and it is scattered over with innumerable glass beads and glass pieces of various shapes and sizes. Numerous lumps of melted glass in various stages and colors are stated to have been found at the site and they include one big massive block of glass about 120 lbs. in weight (18″ x 9″ x 12″ in size). Some of the specimens from this site were received at the Institute for testing and examination and the results are described in this paper.

The objects picked up from the Kopia mound site include terracottas and coins and these coins are reported to range in date from the 3rd century B.C. to the 3rd century A.D. In 1897-98 the remains of a Buddhist stupa situated near the village of Piprahwa in Birdpur Estate, Basti district, at a distance of about 35 miles from the site of Kopia were excavated by Peppe. The bed of the stupa yielded a steatite casket containing, among other objects, tiny glass beads of a type very similar to those found at Kopia. The age of the casket from the inscriptions thereon was fixed to be about 5th century B.C. and from the striking similarity of the Kopia glass beads with those obtained from the Piprahwa stupa, Nagar concludes that the age of this glass factory may be placed about the same period, viz., 5th century B.C.

Specimens received for testing included beads of numerous shapes, sizes, and patterns, lumps of glass separately and also sticking to pieces of what can easily be recognized to be some clay container or crucible which may have been used for heating or melting processes. Such clay pieces are reddish brown in color, hard and stone-like to the touch, and when examined in section appear to have a characteristic structure.

Fig. 1 shows a number of such refractory clay pieces placed in a tray, while Fig. 2 shows the structure in a section of one clay piece.

From the appearance of these pieces, one gets the impression that perhaps a lateritic clay was used for making them and on vitrification this yielded the close-grained, hard reddish brown, stone-like body. One of the pieces was chemically analyzed with the following result:

SiO_2	67.00%
Al_2O_3	25.45%
Fe_2O_3	6.00%
TiO_2	0.95%
CaO	trace

Fig. 1. Refractory clay pieces.

Fig. 2. Structure of the section of a refractory clay piece showing pitted spots (magnification approximately 10 times).

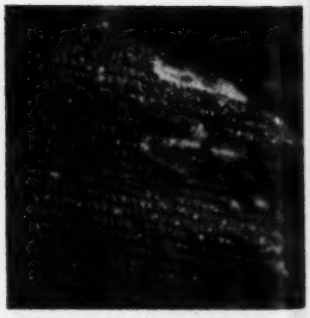
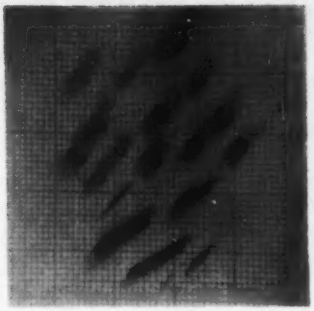


Fig. 3. Check pattern made by one set of parallel furrows running at right angles to another set in one of the pitted spots (magnification approximately 10 times).



Left to right: Fig. 4. Glazed concave surface of one refractory piece. Fig. 5. Two refractory pieces presumably spouts of terra cotta crucibles (scale at the side reads in inches). Fig. 6. Fine, perforated beads of yellow, blue, and black color and lathes or strips of blue and black glasses (specimen Nos. 1 and 3).

MgO	trace
MnO	0.074%
Cr_2O_3	trace
CuO	Nil
Alkalies	Nil
Total	99.47%

The numerous small pitted spots or cavities clearly seen in Fig. 2 appeared to be due to presence of organic matter which got burnt out when the crucible or pot was fired. An examination of the surfaces of some of these cavities or small pit marks under moderate magnification showed a regular check pattern made up of one set of parallel furrows running at right angles to another set as shown in Fig. 3. From this pattern it was evident that rags or pieces of cloth were pounded and used in the clay mix in order to give strength to the crucible while they were made or were green. When the clay body was heated during furnacing, the pieces of cloth or rags got burnt leaving a cavity in which the characteristic texture of cloth was imprinted on the clay surface.

In some of the clay pieces one side, viz., the concave side, which may well have formed the inside of the crucible, had a black glazed surface while the other side had the rough appearance of a hand molded clay article. The glazed surface of one such piece is illustrated in Fig. 4.

Two other pieces of such broken terracotta crucibles or containers, as illustrated in Fig. 5, are also of interest. The upper and larger piece shows what may well have been the spout of the crucible. The material sticking to it had apparently undergone more deterioration than other lumps of glass showed and it was perhaps originally sintered glass batch which had not been thoroughly melted.

The various specimens of beads and other shapes examined are shown in Figs. 6-9, and are briefly described below. The size of the individual pieces in each specimen can be gauged from the mm square graph paper over which the pieces were placed in taking the photographs.

Specimen No. 1. (shown in Fig. 6). Consisted of fine (perforated) beads of yellow, blue, and black color. In diameter they ranged from about 1.5 mm to about 3 mm. As the black beads were the most numerous, five of them were taken for chemical analysis.

Specimen No. 2. Consisted of fine pieces, three of

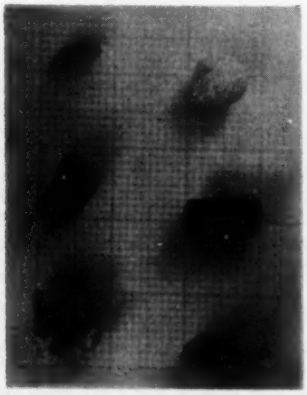


Fig. 7. Glass pieces of different colors (specimen Nos. 2, 4, 5, and 6). Three pieces on the left comprise specimen No. 2. The remaining three pieces on the right are specimen Nos. 4, 5, and 6, reading from below.

Figs. 8 and 9. Miscellaneous specimen of beads.

which are shown in Fig. 7. The smallest one at the top is a greenish blue fragment, while the middle one is part of an opaque greyish blue bead of tubular shape. The third piece is half of a tubular or elongated bead made of transparent glass of pale greenish yellow color. Two such half pieces were used for chemical analysis.

Specimen No. 3. Has been described by Nagar as lozenge-shaped, but the pieces examined were more like laths or strips of blue and black glass as shown in Fig. 6. Five of the dark colored pieces were taken for chemical analysis.

Specimen Nos. 4, 5 and 6. Are shown in Fig. 7 from the bottom upwards. No. 4 at the bottom is of much interest. It is part of a multicolored lozenge-shaped bead which may have been used as a pendant or central bead. It is of opaque blue glass with decoration in black and coral red. A similar piece, but of green color, was analyzed chemically. No. 5 is a black opaque fragment of a bangle flat on the inside and semi-cylindrical on the outside. A similar but larger piece is also shown in Fig. 8. Specimen No. 6 shows an unperforated spherical bead of colorless glass. The surface of the bead appears to be much weathered and pitted, and has a whitish deposit. Two such pieces were used for chemical analysis.

Miscellaneous Specimens. In addition to the above, there were other pieces of various shapes and sizes some of which are shown in Figs. 8 and 9. Three black perforated beads of spherical and barrel shapes having decorative bands in white had an excellent smooth finish. Other beads of round, triangular, square, and hexagonal shapes in opaque white were of a flat type. They had a rougher surface and the facets may have been formed by grinding. Two of the colorless transparent beads shown in Fig. 9 were found to be of quartz having specific gravity above 2.6. One piece shown in the right-hand top corner of Fig. 8 was of particular interest. It was tapered longitudinally and had a bore running through which was flattened at the narrow end. At the broad end, the piece had a ledge showing that it was probably fitted into another tube of which this was the nozzle.

Chemical analyses of the specimens are given in Table I below, while in Table II are given the specific gravities of some of the pieces.

TABLE I
Chemical Analyses

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Silica (SiO_2)	62.24	70.30	64.80	67.13	66.13	63.30	66.60	60.72
Alumina (Al_2O_3)	8.46	5.30	4.90	6.70	7.26	7.09	6.98	10.80
Ferric Oxide (Fe_2O_3)	7.20	1.20	2.95	1.50	0.86	2.50	1.62	0.20
Titanium Oxide (TiO_2)	0.51	trace	0.45	0.40	0.41	1.01	0.51	....
Lime (CaO)	3.13	2.38	3.71	3.03	2.24	3.64	2.40	8.85
Magnesia (MgO)	1.55	1.20	2.10	1.60	1.33	1.85	trace	1.12
Alkalies (Na_2O)	16.70	19.31	21.03*	19.61*	21.70*	20.52	21.70	18.30
Manganese Oxide (MnO)	0.02	0.079	0.057	0.032	0.074	0.095	0.026	....
Chromium Oxide (Cr_2O_3)	Nil	Nil	S.tr.	S.tr.	Nil	Nil	Nil	Nil
Copper Oxide (CuO)	Nil	Nil	trace	Nil	tr.	Nil	Nil	Nil
TOTAL	99.81	99.77	100.00	100.00	100.00	100.01	99.83	99.99

* Figures obtained by difference.
(1) Fine perforated beads of black color—Specimen No. 1.
(2) Plain glass beads of pale yellow color—Specimen No. 2.
(3) Strip like pieces of dark color—Specimen No. 3.
(4) Green colored bead with black and coral red decoration on it—Specimen No. 4.
(5) Fragment of bangle of black color—Specimen No. 5.
(6) Unperforated bead of colorless glass—Specimen No. 6.
(7) Broken pieces of pale yellowish green glass (not of uniform shade) attached to a refractory piece.
(8) Glass from the spout portion of refractory vessel; this is probably unmelted but sintered glass batch.

The low CaO and MgO content of the above Kopia glasses is an interesting feature. Excepting in the case of item No. 8, this ranges from 2.40% to 5.81%. Among all the ancient glasses reported upon by Neumann,[1-4] there are but a few only with such low lime and magnesia. All glasses from Babylonian Assyrian sources have a much higher lime and magnesia content of about 10 to 12%. The few glasses having low figures for CaO and MgO are either of Egyptian or Roman origin and, in the latter case, belong to a period much later than that of the Kopia glasses according to Nagar. Some of the Taxila

(*Continued on page* 392)

CHEMICAL HAZARDS IN GLASS AND CERAMICS INDUSTRIES

By JOSEPH A. HOUGHTON, Industrial Hygienist
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Exposures to mineral dusts have been and still are the important exposures in the glass and ceramic industries, and the causes of the greatest losses both in time and in money. The pneumoconioses, particularly silicosis, resulting from the inhalation of these mineral dusts have been described and discussed in many papers and no attempt will be made to go into detail on the classical exposures.

There has been an increasing tendency to make compensation awards for all types of pneumoconioses, whether the individual has typical clinical symptoms or not. The main criterion for making these awards has frequently been whether the individual has been exposed to high concentrations of a dust (any dust) and whether it has appeared to aggravate a coexisting bronchial or other lung condition.

Many dusts have been considered to be nuisance dusts in the past and not serious health hazards, but it is becoming necessary for industry to attempt to control all types of dust whether the dust contains free silica or not. This applies to all dusty industries and not just to the glass and ceramic industries.

Strictly speaking, all materials used in the glass and ceramic industries are chemicals, for minerals have definite chemical compositions or they are mixtures of materials that have known compositions. The discussion of dusts will be limited to those materials which have physiological effects associated with a particular element in their composition, with particular reference to the metallic elements.

Any chemical misused can cause physiological disturbances and these may result from contact, from ingestion, or from inhalation. Some materials have greater physiological effects than others for a given dosage, but with any chemical it is a question of quantity in the exposure, how it is used or misused, and the length of time and frequency of exposure. There is a standard answer in our company that is given to engineers who send in a sample of material with the question "Is there anything toxic in this?", without giving any information as to what it is used for. The answer is always "yes," for if a particular mixture was used as an ingredient in salad dressing, for example, it could be quite toxic or at least cause serious gastric distress. Conversely, there is no material used in industry which cannot be handled safely.

Arsenic, as the trioxide, is probably an outstanding example of a very toxic material which is handled safely in the glass industry. It is a material that can be toxic by any route for it can have serious effects on the skin and can be quite poisonous when ingested or inhaled. It is one of the oldest poisons used for homicidal purposes.

Engineers who see the open barrels of the arsenious oxide in glass manufacturing plants are generally quite worried about the condition when they see it for the first time. But experience has indicated that there is apparently no cause for alarm for there does not seem to be any cases of arsenical poisoning in glass manufacturing. There probably are small amounts of arsenic inhaled by men who handle this material, but the quantities are small and are not great enough to cause any difficulty.

The well-advertised reputation of arsenic as a poison is probably the main reason why there is so little trouble from the handling of compounds of this element and there are many other materials which need as much publicity. There have been arsenical poisoning cases in other industries, mainly from arsine gas, but this gas would not be expected in the glass and ceramic industries for its formation requires reducing chemical conditions.

Considering some of the other highly toxic materials used, lead is still probably the one most widely used although other materials have been substituted for lead in low melting glasses and glazes. We seldom hear of the advanced classical symptoms of lead poisoning which occurred in the past and it is becoming common usage to refer to cases as lead intoxication where only the minor symptoms are present. In the batching of glass and ceramic mixes, it is necessary to handle the lead compounds carefully, such as the oxide and carbonate, for these dusts are readily dispersed and inhaled. In general, control at this type of operation is good throughout the industries, but as a practical matter it is impossible to control all such dusts completely under all conditions and employees may absorb some lead dust.

It has been argued that the lead silicates which are formed during firing are not toxic for they are completely insoluble, but unfortunately this is not true. The lead silicates are not as readily absorbed as the lead oxide or carbonate, but over a period of years enough may be absorbed and stored in the body to cause clinical signs and symptoms. These clinical signs and symptoms are not the classic ones of the lead line in the gums nor the wrist drop, but minor symptoms such as gastric disturbances or the colic and a tiredness or lassitude. These symptoms may be minor, but over-all they can effect the work performance of the individual and his general feeling of well being.

Our medical division has listed about 29 signs and symptoms of lead intoxication, any one of which can appear to be a sign of some other bodily disturbance and they can only be interpreted on an over-all basis in conjunction with an evaluation of the work exposure. Whenever there is a continuous exposure to any lead compound or to any lead working operation, such as a heavy soldering operation, it may be necessary to have both engineering and medical control.

If visible dust or fume is present around lead working operations, then an engineering survey is indicated to determine what controls are needed.

Control of Exposures

To digress a moment to discuss what we mean when we mention controls, the main object is to prevent or to lessen the exposure of individuals to the material that may cause trouble. The exposure may be from contact with the skin in handling and controls may require such

Portion of a paper delivered before the Sixth Annual Meeting of the Glass and Ceramics Section, National Safety Congress.

things as automatic handling, or material handling equipment, or protective gloves and other clothing, or perhaps better work practices with careful handling, and frequently good personal hygiene with regular washing and change of clothing. Exposure may be from ingestion of the materials, which may require such things as better work practices to prevent contamination, eating areas away from the working area where the toxic materials are handled, and careful personal practices.

Exposure may be from inhalation of dust and this is generally the most serious exposure. This is the type of exposure where enclosure and exhaust ventilation are needed and the object is to prevent the dust from escaping into the workroom atmosphere where employees can inhale the dust. The general methods of control of dust are: (a) isolation, for example, automatic weighing and batching equipment controlled from a remote station; (b) keeping dusty products moist wherever possible, for the dust will not be dispersed; (c) complete enclosure where dust is confined or just vented from the enclosure to the outside, such as a completely enclosed blender or grinder; (d) exhaust ventilation where an exhaust hood is close to the point where dust is dispersed; a local exhaust hood at a belt transfer point or a dumping station can be much more effective than a fan placed in the wall to provide general room ventilation; (e) substitution of a less toxic material, such as the use of bismuth instead of lead in low temperature frits; and (f) respiratory protection using approved respirators, but respirators should be used only where all other methods fail, for respirators will not be worn continuously and should be reserved for short time exposures only.

With the engineering controls listed, a good medical control is essential particularly with the highly toxic materials. Engineering controls alone are not always satisfactory for there may be an exposure which escapes notice or which is not entirely controlled. Medical controls alone will not be satisfactory, for it is not economical to have medical checks just to determine when an individual needs treatment or removal from an exposure. Engineering controls and medical controls must work together to be effective.

An engineering investigation will indicate to the doctor just how comprehensive the medical control should be. If the exposure is comparatively small, then the medical checks do not need to be as frequent or as extensive; but if the exposure is large, then close and extensive medical controls may be needed. The doctor can be of particular help in convincing employees of the need of better work practices, careful handling of harmful materials, and the need of good personal hygiene practices.

Individuals will pay better attention to advice from the doctor or the nurse than they will from any arguments or advice from lay individuals on these matters. The doctor can also detect signs in individuals to help point up exposure points that may have been overlooked. And with the engineering controls mentioned for individuals in the plant, consideration must also be given to the possible damage to neighbors or the public from dust or gases discharged.

This requires an engineering investigation (which is mainly careful observation and some common sense) to determine the potential harm which may be done. Air sampling to determine the magnitude of the exposure generally requires special equipment and techniques and maybe dust counting, chemical analysis of the material sampled, or special meters.

To come back to lead and other exposures, a standard of 1.5 milligrams of lead per 10 cubic meters of air has been set as a standard for continuous exposure in a work room atmosphere. It must be realized that many individuals can stand exposures in excess of this without any harm and that this limit has been set to try to protect the more susceptible individuals. If air sampling shows concentrations in excess of this limit, then engineering controls are needed. If exposures are around this limit, there is a chance that some clinical signs and symptoms will show up in a few individuals and as soon as any work room exposure starts to approach this MAC, then a medical control program is advisable. The more severe the exposure, the greater the need of medical control. It is not always practical to install complete engineering and environmental controls and in these cases medical control is a must and must be worked in conjunction with the engineering controls.

Highly toxic materials, such as selenium, cadmium, and antimony, are used in comparatively small quantities as colorants and decolorizers in glass and enamel manufacture. The handling of these materials requires close engineering control wherever they are used whether in the batching of mixes or in the spraying of frits containing these materials. Selenium is probably not the bad actor in industry that it was in the past for most of the selenium now available is quite pure. The malodorous body conditions from the use of selenium apparently came from small amounts of tellurium which was associated with it, but at present most of the tellurium is removed for other purposes.

There are other materials that are highly suspect although not as well advertised as toxic materials. Barium compounds, particularly the more soluble compounds, are potentially serious. The sulphate being the most insoluble of the ones in common use is probably the least harmful and it is regularly given internally as a radio-opaque material which will coat the intestines for an X-ray examination. The horrible looking and tasting suspension which the doctors give to their patients is given without any physical harm although some barium may be absorbed, but realize that this is given only once or twice to a patient and that the patient does not have a continuous daily exposure to this material. The sulphate is used as a flux in a few types of glasses and enamel and there probably is very little difficulty from its use. Inhalation of barium sulphate dust and other insoluble barium compounds can result in radio-opaque deposits in the lungs, just as well as the intestines when the compound is swallowed, for this is a high molecular weight element which has good stopping power for X-ray.

The X-ray shadows from barium deposits in the lung can simulate those of discrete nodular silicosis and although these deposits are of little consequence as far as the health or disability of the individual is concerned, the lung markings may have a bearing in the case of any claims. Also, with the wide-spread use of mobile X-ray units, we know of several very alarmed individuals who received notices that they had a serious chest picture which needed follow-up.

Any employees who are exposed to dust from barium compounds should be advised of this possible complication for it would be impossible for a physician to diag-

nose the condition without knowing the type of exposure. And it would need some very expert advice to be able to tell the man that it is a benign condition which would not cause any disability. I know of one recent case that occurred where the man was using molten barium chloride for heat treating of parts and inhaled the fumes as parts were removed from the hot salt, over a period of years. He felt perfectly well and had no disability of any kind until he had a routine X-ray picture taken and the first alarm of the physician had him greatly worried. Although they have since tried to assure him that there is nothing seriously wrong, he is naturally worried about the chest condition. The use of other barium compounds, such as the nitrate, fluoride, and carbonate, is increasing in enamels, glass, and pottery and these can be potentially serious if absorbed into the body by ingestion or inhalation.

Although cases are few from these comparatively soluble barium compounds, we know enough of the properties to know that they must be handled carefully. Barium carbonate is the toxic agent in some rat poisons and we have a number of dead cows to pay for where barium carbonate dust was spread around the countryside and the animals ate the contaminated foliage.

The fluorides, such as apatite, cryolite, fluorspar, and the soluble fluoride compounds are another group that are suspected of being potentially harmful. Large tonnage quantities of the minerals have been used in the ceramic and in other industries apparently without serious harm, but it may be that the full clinical picture has not been described. This suspicion has been created by the large number of cases of damage to animals where they have eaten foliage contaminated with fluorides.

Cryolite has a low solubility in water, but even with this low solubility it is an excellent insecticide and in large quantities can do serious harm to men as well as to insects. It is advisable to keep dusts from all fluoride compounds down to a minimum and this applies to frits which might be sprayed, as well as to the batching and transfer of the original mixes. Apparently the tolerance of humans for such insoluble fluorides as cryolite is fairly high and mathematically this would work out to about 50 milligrams of this dust per 10 cubic feet of air which is a fairly large quantity which would be visually considered to be a heavy dust concentration.

The increasing use of lithium minerals and salts in the manufacture of glass, glazes, enamels, and whiteware bodies may occasion some concern. The serious cases of lithium poisoning have come from the use of lithium chloride as a substitute for salt in certain medical conditions and the effects have been quite severe. It is not known just what the cause of the condition is, but it is possible that it is an upset in the sodium-potassium balance in the body caused by the chemical similarity of the lithium.

In the medical cases, it would appear that the effects of lithium are not accumulative for the lithium was not stored in the body and the patients rapidly recovered when the lithium salt was removed from their diet. The use of lithium carbonate would be the most suspect and high concentrations of dust from the handling of this should be avoided.

This discussion does not indict all unusual exposures for there are a few materials which seem to be practically non-toxic. For example, titanium dioxide has not shown any serious disability either in animal experimentation or in the various other manufacturing uses such as in the paint industry. Cerium oxide is becoming more commonly used particularly as a polishing agent, and animal experimentation and use in industry would seem to show that this is almost harmless. Cerium resembles aluminum in its pharmacological action as well as in chemical properties and fairly high doses of the oxalate have been given as a drug. There are a few of the more soluble cerium compounds which have shown some clinical signs on use.

Contact Hazards

Skin hazards and exposures in the glass and ceramic industries will come mainly from acid and caustics. Arsenical compounds can cause a severe dermatitis and in some industries have been indicted as a cause of cancer, but a recent study points out that arsenious oxide is not a serious carcinogen in the ceramic industry and with care in handling these difficulties should not be encountered.

With the acids and caustics there is a fairly long list which will include the alkaline carbonates and the three main acids used—hydrofluoric, sulfuric, and hydrochloric. Accidents will come mainly from improper methods of handling. The hazards and precautions for handling these acids and alkalis have been thoroughly covered in publications of the Manufacturing Chemists Association and in the data sheets of the National Safety Council and it should not be necessary to discuss them here.

Solvent Exposures

Solvents have a somewhat limited use in the glass and ceramic industries except for some metal cleaning. But in most every plant there will be solvents used by the maintenance department, and in particular they will use carbon tetrachloride for cleaning electric motors.

It is not possible to tell maintenance men that there are satisfactory substitutes for tetrachloride for cleaning electric motors. There are other solvents that will clean the motors, but carbon tetrachloride is still the easiest to use and it is the most effective. None of the substitutes can do the job as well. With carbon tetrachloride, the electrician can place a small motor in a bucket of this solvent and go on with his other work knowing that he can return at his convenience, complete the cleaning, and it will dry rapidly. With others, like trichlorethylene, perchorethylene, stoddards solvent and mixtures of these with other solvents, he is not always sure that there will not be an attack on the winding or other insulation in the motor. These solvents will attack and swell (if not dissolve) some types of insulation and there is no way of telling beforehand. A number of motors have had to be rewound from this cause.

But carbon tetrachloride is a dangerous solvent from its toxic action and we have a list of seven deaths from improper use of carbon tetrachloride which were reported to our company within the past year and a half. We do not have a tabulation of individuals who have been made ill from its use, but the chances are good that there have been many.

Substitute solvents for carbon tetrachloride can be used, even for motor cleaning, if they are properly used. For electric motors, the motor should not be permitted to

(*Continued on page* 394)

Inventions and Inventors

Feeding and Forming

Lamp Stem Fabricating Apparatus. Patent No. 2,637,144. Filed December 27, 1945. Issued May 5, 1953. 13 sheets of drawings (none reproduced). Assigned to Sylvania Electric Products, Inc. by Roland M. Gardner, Stanley J. Gartner and Edwin W. Barrett.

This invention pertains to an automatic machine for fabricating glass stem elements for lamps or thermionic devices. The machine is provided with a pair of chain type conveyors having a plurality of stem carrying units. The two conveyors are driven at the same speed and are superposed or arranged in other suitable cooperative relationship. The major portions of the conveyors travel in a straight line lengthwise along the frame and are driven by suitable sprockets. One conveyor is shorter than the other and so arranged that its operative elements function for only a portion of the operating cycle of the other conveyor.

Extending parallel with the conveyors and journalled in the frame are two or more cam shafts driven in timed relation to the conveyors and having cams thereon which actuate operational devices which function successively to fabricate the stem assemblies carried by the conveyors. The operational devices are secured along the frame in predetermined succession adjacent the conveyors.

Means are provided for positioning the operational devices at any point along the frame and maintaining predetermined correct relationship with the stems carried by the conveyors. Thus accurate and readily established timing of the operations is obtained.

The patent contains ten claims and 19 references were cited.

Apparatus for Forming Glassware. Patent No. 2,637,944. Filed April 29, 1947. Issued May 12, 1953. One sheet of drawings, (non reproduced). Assigned to Emhart Manufacturing Company by Charles F. Claughesy.

An apparatus is described for forming glassware in which a charge of molten glass is formed into a hollow parison after which the parison may be formed into a finished glass article. The apparatus is provided with a plurality of movable pressing plungers, the pressing movements of which are individually regulatable according to the pressurization of associated pneumatic mechanism by means of novel valves. The valves are operated by an air motor and separately regulate the pressure and flow of fluid to the pressing plungers. The vertical movements of the plungers may be controlled by positive stops which may be varied as desired.

The patent contains one claim and 13 references were cited.

Glassworking Machine for Cathode-ray Tubes. Fig. 1. No. 2,637,942. Filed January 25, 1950. Issued May 12, 1953. Four sheets of drawings. Assigned to Corning Glass Works by Ray A. Hinkley.

An apparatus for perforating a glass article wall and for closing the resulting perforation with an element through which an electric current may be passed between

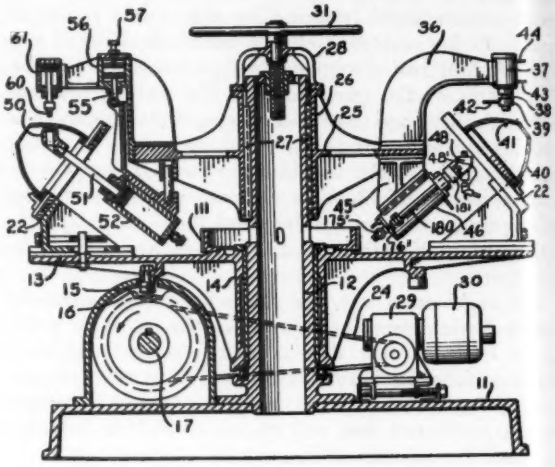


Fig. 1.

opposite sides is shown in Fig. 1. The invention is of particular utility in the manufacture of glass cathode-ray tubes in general use in the television industry.

The perforating equipment comprises a die 50 carried on the free end of piston rod 51 of a differential pneumatic unit 52. Unit 52, however, instead of being mounted in fixed relation to spider 25, is suspended from the piston rod 55 of a pneumatic unit 56. The unit 52 is adapted to advance the die 50 into vertical alignment with the punch 60 of a pneumatic unit 61, but stops the die short of the height necessary to bring it into engagement with the tube. Unit 56 is subsequently operated to raise unit 52 the necessary distance to bring die 50 into engagement with the associated tube. An adjusting cap screw 57 enables precise adjustment of this latter operation.

Unit 56 is operated by fluid supplied through a cam actuated by a valve (not shown). The machine incorporates many safety features and the complete timing apparatus is understood after a study of the many drawings.

The patent contains eight claims and the following references were cited: 2,011,980, Miller, Aug. 20, 1935; 2,192,302, Errett, Mar. 5, 1940; 2,209,252, Stewart et al., July 23, 1940; 2,314,826, Hinkley, Mar. 23, 1943; 2,339,850, Goodale, Jan. 25, 1944; 2,410,345, Hinkley, Oct. 29, 1946; 2,427,712, Casler et al., Sept. 23, 1947; 2,492,162, Litton, Dec. 27, 1949; and 2,553,135, Eisler, May 15, 1951.

Furnaces

Glass Induction Furnace. Patent No. 2,635,125. Filed September 30, 1949. Issued April 14, 1953. Two sheets of drawings (none reproduced). Assigned to American Optical Company by Lee O. Upton.

An induction type of furnace for glass melting is presented in which a pot containing the glass is radiantly heated by a secondary coil. The latter is completely encased in refractory materials so as to lessen oxidation and to decrease the discharge of reaction products therefrom which may be detrimental to the glass. The furnace may

also be adapted for controlled atmosphere such as reducing, oxidizing, or neutral. Other advantages cited for the furnace are uniformly and accurately controlled temperatures during melting and means of precision annealing the glass within the furnace.

The patent contains seven claims and 14 references were cited.

Glass Compositions

Stabilized Pulverulent Compositions Containing Finely Divided Glass. Patent No. 2,639,992. Fined July 20, 1950. Issued May 26, 1953. No sheets of drawings. Assigned to Garco Products, Inc. by Edwin W. Tillotson.

This invention relates to stabilized pulverulent compositions containing finely divided glass and to a process of obtaining these compositions. The object of the invention is to provide means for controlling the alkalinity of a pulverulent mixture, including a substantial proportion of glass, during storage and handling thereof.

Waste sand-glass mixture is stabilized by adding a small quantity of finely divided alkali metal fluosilicate and preferably potassium fluosilicate. The addition may be made to a slurry of the waste sand after the raw material, discharged from the plate glass grinding operation, has been purified and concentrated. The treated slurry is then filtered and dried. The stabilized mixture will have a pH of about 4.0, and this will remain constant indefinitely in the absence of moisture. The following table illustrates the effectiveness of the treatment:

Days of Storage	*pH*
0	3.85
8	4.21
14	4.41
21	4.62
28	5.01
42	5.52
49	5.55
63	7.00

This treatment greatly enhances the stability and usefulness of finely divided glass mixture. The patent contains six claims and the following reference was cited: 367,537, Germany, 1923.

Glass Wool and Fiber

Process of Removing Size from Glass Fibers. Patent No. 2,633,428. Filed January 22, 1949. Issued March 31, 1953. One sheet of drawings (none reproduced). Assigned to Alexander H. Kerr and Company, Inc. by Clarence Klug.

Size must be removed from glass fabrics for specific applications and uses. By means of novel heat treatment, glass fabric can be moved relatively rapidly through an appropriate heating zone in which there is an abundance of oxygen to support the combustion of the size. The glass fabric can be progressively heated in the entrance section of the heating zone to decompose and to vaporize certain constituents of the size which ignite by auto-ignition and burn as a surface flame adjacent to a relatively short transverse section of the fabric.

Furnace temperature of about 1100-1400°F., have been found desirable. In the finishing zone, it is desirable to coat the fabric with a silicone or other liquid substance, applied as a solution or aqueous emulsion. This treatment gives additional softness or "hand" or drapability to the fabric and also gives additional protection against self-attrition and external abrasion.

The patent contains 13 claims and ten references were cited.

Glass Filaments. Fig. 2. Patent No. 2,635,389. Filed March 21, 1950. Issued April 21, 1953. Four sheets of drawings. Assigned to Glass Fibers, Inc. by Harry A. Toulmin, Jr.

A method utilizing the principles of a thermal jet is used for producing continuous length glass filaments. The speed at which the continuous fibers is made is greatly increased and diameters as small as .0018" to .0025" are possible.

The heating and attenuating apparatus of Fig. 2 consist of a combustion chamber 130 having an intermediate double partition wall 131 forming a slot 132 through which the glass fibers or strands 25d are passed. Fuel, such as liquid hydrocarbon, is introduced into the com-

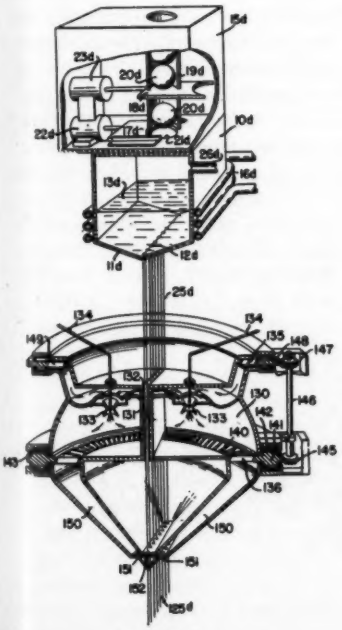


Fig. 2.

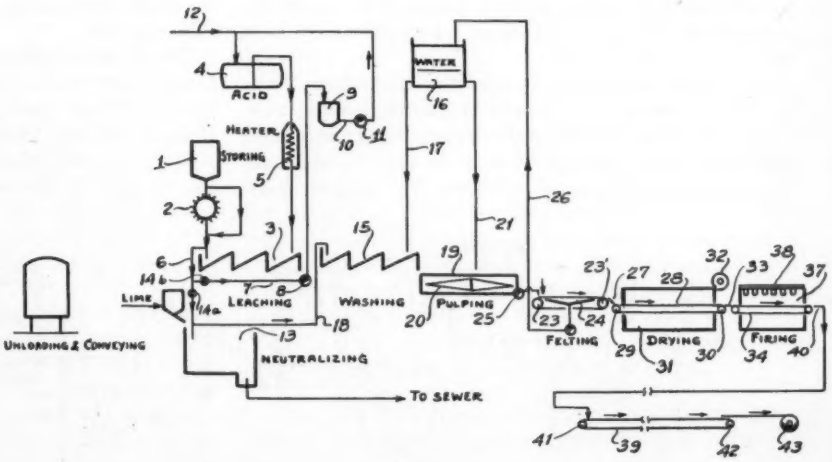


Fig. 3.

bustion chamber by means of the fuel jets 133 supplied with fuel through the pipes 134. Air under pressure is supplied into the combustion chamber 130 by means of a centrifugal compressor 135 that is driven by a turbine 136 placed in the discharge side of the combustion chamber 130.

The turbine 136 consists of a plurality of vanes 140 carried on a rotating ring 141 supported on roller bearings 142. The outer periphery of the ring 141 forms a gear 143 that drives a pinion 145. The pinion 145 is secured on the lower end of a drive shaft 146 which receives the pinion 147 on the upper end thereof which drives the ring gear 148 of the centrifugal compressor 135, the ring gear 148 carrying the vanes 149 of the compressor 135.

Combustion of the fuel in the chamber 130 produces high gas pressures which drive the turbine 136 by the passage of gas through the vanes 140. The spent gasses passing through the turbine then pass into the chamber 150.

The gas in the chamber 150 is discharged through jet openings 151 placed at opposite sides of the openings 152 and in planar alignment therewith for engaging opposite sides of the glass filaments 125d for attenuation of the strand 25d upon being re-heated in passage between the walls 131 of the combustion chamber 130. Various other principles are presented to accomplish direct attenuation of the fibers.

The patent contains two claims and the references cited were: 2,269,459, Kleist, Jan. 13, 1942; 2, 294, 266, Barnard, Aug. 25, 1942; 2,489,242, Slayter et al, Nov. 22, 1949; and 2,571,025, Fletcher, Oct. 9, 1951.

Method of Forming Batts of Silica Fibers. Fig. 3. Patent No. 2,635,390. Filed December 19, 1949. Issued April 21, 1953. One sheet of drawings. Assigned to H. I. Thompson Co. by Leon Parker.

A process for leaching glass fiber batts to remove the non-siliceous oxides is described. The procedure is best described in Fig. 3.

The fibers may be fed into a leaching or washing apparatus 3, as, for example, a Dorr Multideck Classifier. The leaching solution depends upon the type of glass employed. Such acids as HCl, HNO_3, trichlor acetic acid, or acetic acid may be used. Storage tank 4 contains HCl acid of strength of from about 5 to about 15%. The acid is fed through a heater 5 where it is heated to a temperature of from 100°F. up to boiling; temperatures of about 140 to 180°F. are desirable.

The washed fibers are separated as a thick slurry from the bulk of the acid and conveyed into the washing system 15 of design similar to 3. Water, for example, distilled water, from storage 16 may be used to wash the fibers substantially free of chlorides. The washed fibers are introduced into pulping tank 19 where the fibers are agitated and dispersed by agitator 20 in the presence of water added through 21. The pulp is discharged through line 21 by pump 22 onto a traveling porous belt. The belt travels over a vacuum chamber 24 and the excess water is sucked into the vacuum chamber 24.

The felted fibers are in the form of a batt and are fed off the belt 22 via guide 27 onto the belt 28 operated by pulleys 29 and 30 to pass through a conventional tunnel drier 31 operated in conjunction with a suction fan 32.

The dried batt is then passed over guide 33 onto the traveling belt 34. The batt passing with belt 34 through the furnace 37 is exposed to the flames from burners 38 and heated to a temperature of 1500-2000°F. to dehydrate and shrink the fibers. The shrinkage of the fibers on heating improves the interlock between the fibers in the batt.

The fired batt is fed off belt 34 to belt 39 via guide 40 and is air-cooled during passage of the belt driven pulleys 41 and 42. The cooled batt is fed off the end of the belt 39 and wound into rolls 43.

The patent contains eight claims and 11 references were cited.

Sheet and Plate Glass

Zirconium Oxide Polishing Material. Patent No. 2,624,661. Filed December 3, 1949. Issued January 6, 1953. Three sheets of drawings (none reproduced). Assigned to National Lead Company by John B. Miller.

Zirconium dioxide is first prepared from zircon or zirconium silicate, by reduction in the presence of carbon and air with the formation of complex carbon and nitrogen compounds designated as zirconium cyanonitride. This process is in accordance with U. S. Patent No. 2,270,527. This product contains large quantities of cyanonitride and dry grinding presents a definite hazard due to the presence of finely divided inflammable cyanonitride. The explosion hazard is overcome by calcining the —35 mesh material in a rotary calciner to a temperature of 1300°C. After cooling, the calcined material is ground in a continuous dry grinding mill. The material is further classified into —44 micron material.

The product is mainly crystalline zirconium oxide, the refractive index of which was in the range 2.09 to 2.23. The zirconia so obtained contains from 3% to 6% silica by weight and about .05% of a stable carbide such as siliconcarbide.

The patent contains one claim and the following references were cited: 1,558,476, Kinzie, June 15, 1926; 1,881,303, Weiss, Oct. 4, 1932; 2,270,527, Kinzie, Jan. 20, 1942; 2,315,519, Hake et al., Apr. 16, 1943; 2,489,307, Miller, Nov. 29, 1949; Riegel: "Chemical Machinery," pp. 33 and 34, Reinhold Pub. Co., N. Y. (1944) and

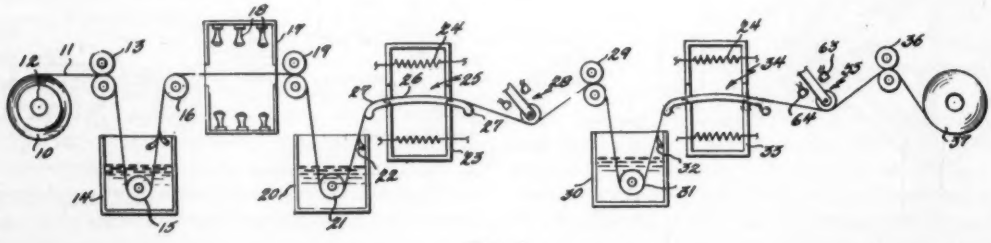


Fig. 4.

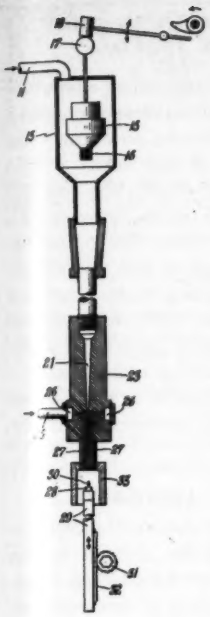


Fig. 5.

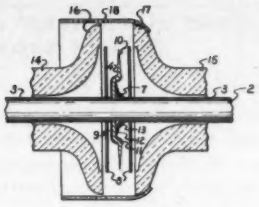


Fig. 6.

Condensed Chemical Dictionary, 3d ed., Reinhold Pub. Co., N. Y. (1942), p. 689.

Miscellaneous Processes

Continuous Enameling of Sheet Metal. Fig. 4. Patent No. 2,631,561. Filed January 3, 1951. Issued March 17, 1953. Two sheets of drawings. Robert G. Calton.

An apparatus for the continuous enameling of thin sheet steel is shown in Fig. 4. A coiled roll 10 of thin sheet metal 11 ranging from 20-40 gauge is passed by means of driven rollers 13 through a vat 14 filled with nickel sulfate solution (12 oz. 1 gal.). The sheet then passes through a drying chamber 17 heated by lamps 18. From the drying chamber the sheet passes through a vat 20 containing ground coat slip. The sheet is held below the surface of the slip by means of the idler roller 21.

From the coating vat 20, the sheet passes over a rubber stripper or squeegee 22, which removes the enamel slip from the bottom of the sheet, and then through a firing furnace 23.

During its passage through the firing furnace, the sheet is supported by and slides over the upper surface of a metal arch 25. The arch 25 is wider than the sheet and is preferably made in three sections, an intermediate section 26 made of nickel alloy to withstand the firing temperature, and end sections 27 made of any suitable material preferably metal.

The sheet is then coated with a cover coat enamel in vat 30 and fired again in furnace 34 after which it emerges as a finished product.

The patent contains two claims and the references cited were: 1,967,130, Nuernberg, July 17, 1934; 2,394,040, Callinan, Feb. 5, 1946; 2,428,307, Calton, Sept. 30, 1947; 2,439,802, Francis, Apr. 20, 1948; 2,469,123, Martin, May 3, 1949; and 2,480,711, Calton, Aug. 30, 1949.

Synthetic Gems. Fig. 5. Patent No. 2,634,554. Filed September 21, 1943. Issued April 14, 1953. One sheet of drawings. Assigned Union Carbide and Carbon Corporation by Malcom H. Barnes.

In Fig. 5 is shown apparatus suitable for producing synthetic gem rods. Oxygen is supplied through a pipe 11 to the interior of a powder dispenser 13 having a container 15 for powder, provided with a sieve 16. The powdered gem material, such as refractory crystallizable alumina powder or alumina-magnesia powder, is sifted from the container 15 by intermittently striking an anvil 17 with a hammer 19, and is conducted by the oxygen into the central passage 21 of a vertical burner 23 from which it is delivered downwardly as a stream of restricted cross-section containing a limited quantity of particles of the refractory material. Fuel gas, such as hydrogen, is supplied to the burner 23 through a conduit 25 opening into an annular distributing chamber 26. From the chamber 26, the fuel gas passes to the lower end of the burner through a plurality of passages 27 surrounding the central passage 21.

The resulting flame heats to a high temperature and melts the powered gem material, which accumulates upon the top of a ceramic pedestal 28 carried by a vertical support 29, forming a thin rod 30 axially aligned with the burner 23.

As the synthetic gem rod 30 increases in length, it is gradually moved or withdrawn downwardly away from the burner 23 in proportion as the particles are deposited by a pinion gear 31 cooperating with a rack 32 on the side of the support 29. Synthetic gem rods in the condition as grown with the apparatus long, thin, transparent single crystals having surfaces which appear to be frosted. Synthetic corundum and spinel rods are advantageous as the raw material from which jewel bearing blanks may be cut.

The patent contains 3 claims and 14 references were cited.

Quartz-to-Metal Seal. Fig. 6. Patent No. 2,630,471. Filed June 19, 1951. Issued March 3, 1953. One sheet of drawings. Assigned to General Electric Company by Leo R. Peters.

This patent is a part of co-pending applications Serial No. 24,522 and provides a means whereby discs of considerable thickness may be hermetically united with quartz.

With the stem components assembled as shown in Fig. 6, an inert gas such as nitrogen is passed through the assembly. The quartz ring 18 is heated by a gas flame and united with flare 16. During the heating of the flares, the wafers 8 are also heated by the flame transmitted through the ring 18 and flares 16 and 17. Tubes 14 and 15 are moved toward each other along the rod 2 to force the flares 16 and 17 against the wafers 8 and the latter against the sealing edge portion 10 of the disc 4 to hermetically unite these members together. The peripheral portions of the flares 16 and 17, extending beyond the wafers 8, are also joined to each other during this step.

The heating is continued and the heating flame is directed so as to collapse first the portions of flares 16 and 17 opposite the foiled covered portions of the disc 4 and the joint 7 and then the body of tubes 14 and 15 is collapsed onto the foil covering 3 of rod 2. This increases the mechanical strength of the stem. The flame is then removed from the stem, the vacuum pump is disconnected and the stem is allowed to cool. The electrode 6 may then be mounted on the rod 2, as by welding to complete the stem assembly.

The patent contains four claims and the reference cited was: 2,054,521, Greiner, Apr. 18, 1950.

Zinc Borate Phosphor. Patent No. 2,631,133. Filed June 4, 1951. Issued March 10, 1953. No sheets of draw-

(*Continued on page* 394)

OWENS-ILLINOIS CONSOLIDATES PUBLICITY OPERATIONS

K. A. Hamel

Owens-Illinois Glass Company has announced the consolidation of all its publicity operations into a single unit within the Public Relations Department. Previously, the Public Relations Department handled all publicity except that on products of the Glass Container Division which was prepared by a Division staff.

In the new organization, Joseph M. McGarry, as Press Relations Manager, will supervise the preparation and release of all publicity and will be immediately responsible for the corporation's press relations. He will report to E. D. Dodd, Public Relations Director.

Kenneth A. Hamel, as Product Publicity Manager, will supervise the product publicity of all operating units of the company and will be responsible to Mr. McGarry.

Before joining Owens-Illinois in 1951, Mr. McGarry was press representative for The Curtis Publishing Company. Prior to that he was a reporter and Washington correspondent for The Philadelphia Evening Bulletin.

Mr. Hamel has been with Owens-Illinois since 1944 and was Publicity Manager of the Glass Container Division's Market Development Department. He was formerly a reporter on the Toledo Blade and on the Toledo News-Bee.

REFRACTORIES INSTITUTE ELECTIONS

F. H. Atwood was elected President of The Refractories Institute at the annual membership meeting recently held. Mr. Atwood is Vice President in Charge of Personnel and assistant chief counsel of Harbison-Walker Refractories Company.

W. A. Turner, President of The McLain Fire Brick Company, was re-elected Treasurer of the Institute and J. L. Crawford, retiring President, was elected an Honorary Associate Member.

NATIONAL SAFETY COUNCIL ISSUES HANDBOOK

The National Safety Council's new "Handbook of Accident Prevention for Business and Industry" is a convenient safety guide for the manger of a small business or the supervisor of a department in a large organization.

The handbook shows how to set up and maintain a safety program. Detailed information is included on subjects such as plant layouts, materials handling, housekeeping, machine guarding, electrical hazards, pressure vessel hazards, first aid, fire prevention, and personal protective equipment.

The 94-page handbook advises the small business man who cannot afford to employ a full-time safety specialist how to make use of outside assistance. Service and insurance organizations, governmental agencies, trade associations, and professional societies which can help the small operator are described.

FOOD MACHINERY & CHEMICAL CORP. ENTERS SODA ASH FIELD

Food Machinery & Chemical Corporation has announced that the soda ash refining facilities at Westvaco, Wyoming, reached commercial production levels on or about June 15 and deliveries commenced at that time.

These facilities constitute the first wholly new soda ash manufacturing operation since 1935 by the first new producer to enter the soda ash industry since 1912. The corporation's Westvaco Chemical Division will operate the plant for the Intermountain Chemical Company and will also act as exclusive sales agent. Both light and dense ash will be available which will meet the chemical and physical requirements of all soda ash consuming industries.

The new mining and refining operation is located over a vast deposit of Trona which will provide a limitless new supply of soda ash.

NBS SPECTROSCOPIST HONORED

Dr. William W. Coblentz, retired National Bureau of Standards physicist, has received the second Annual Award of the Society for Applied Spectroscopy in recognition of his pioneering work in the field of infrared spectroscopy. The Award was presented at the eighth annual conference of the Society, which serves as a common meeting ground for scientists and industrial organizations interested in the industrial applications of spectroscopy. The Society's first Annual Award was given last year to Dr. William F. Meggers, Chief of the NBS Spectroscopy Section.

Dr. Coblentz's fundamental research in infrared spectroscopy laid the foundation for present-day methods for the anlysis of large, complex organic molecules, while Dr. Meggers' works on atomic spectra has been basic to modern spectrochemical techniques for the anlysis of metals and other inorganic materials.

THE COVER

The latest in a series of artworks, conceived by the American Iron and Steel Institute, depicts the historic moment in which the first bottle was produced on Michael J. Owens' automatic bottle blowing machine. A full-color painting of Mike Owens, standing before his invention examining one of the first machine-made bottles, was reproduced on the back cover June issue of *Steelways*, the Institute's publication.

Under the heading "Bottle Bonanza," the copy describes the invention of the machine as the fulfillment of Mr. Owens' life-long dream. With the financial help of Edward Drummond Libbey, Mr. Owens and his machine revolutionized the glass container industry.

In its account of Mr. Owens' development, *Steelways* said, "To produce the machine, Owens and Libbey pooled their resources and formed what is now the Owens-Illinois Glass Company. Their mechanical octopus was the biggest development in thousands of years of glassmaking, and when it replaced the human lung power, it also breathed new life into the bottle industry and sparked world-wide distribution of everything from catsup to cosmetics."

Research Digest

Editor's Note: The following digest, although it does not deal with any phase of glass technology, was nonetheless considered to be deserving of space in this department since it presents highlights of the results of a scientific study which should be of great interest to the glass manufacturing industry.

For several years, manufacturers of eating and drinking utensils made of products other than glass or ceramic ware have been vigorously promoting their wares. However, the report digested below on the cleanability of various types of eating surfaces gives the glass manufacturer irrefutable data on a primary virtue of glass with which to meet competition from certain competitive materials.

Bacterial Cleanability of Various Types of Eating Surfaces

The role of multiple-use eating utensils in the spread of infection was pointed out as early as 1919, with recommendations for proper washings and sterilization to render them safe for use. Since that time, various health agencies have set up many regulations in an effort to secure a bacteriologically safe eating utensil.

All of these regulations emphasize that the most important factor in eating utensil sanitization is removal of bacteria, i.e., cleaning. This is the first step in any sanitization process. Subsequent steps of disinfection are necessary only as the cleaning process fails in its purpose. This applies whether the bacteria are associated with soil or not. Obviously then, sanitation of a surface will be achieved most readily with those surfaces to which the lowest residual numbers of organisms adhere after cleaning.

Up to the present time, research studies on removal of bacteria from surfaces have been limited by the lack of an accurate means of measuring the total bacteria residual present on a surface. The use of radioactive isotopes in the tagging of bacteria now makes possible a more direct measurement of the actual bacteria residual on a surface before and after cleaning procedures. They also provide a more accurate laboratory method for determining those factors which influence the completeness of bacteria removal. Final degree of sanitization, regardless of whether it is by heat or chemicals, will be most effective on the surface with the lowest possible residual contamination.

A comprehensive report by Ridenour and Armbruster (*American Journal of Public Health*, February 1953) gives an account of some of the preliminary researches of the Department of Environmental Health School of Public Health, University of Michigan, on the bacterial cleanability of eating surfaces of different materials by two radiological procedures. Among the factors studied were: type of material, conditions of surface, effect of different types of organisms, effect of various types of organic soil, effect of repeated washings, and effect of soil build-up by repeated soiling and washing.

The different eating surfaces studied were dinner plates made of glass, china, plastic, stainless steel, and aluminum. The various plates were selected from different manufacturer's products commonly found in the field. The results and conclusions from these studies are as follows:

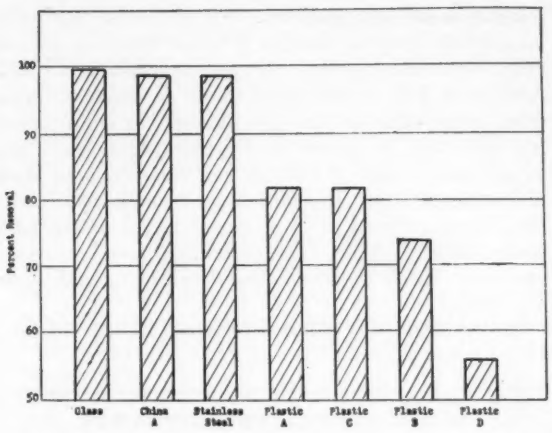


Fig. 1. Per cent removal of *M. aureus* from various worn surfaces when deposited under a protein soil film with detergent wash and rinse at 160°F.

(1) Some types of organisms may be so strongly adsorbed on some surfaces that normal methods of dishwashing may fail to remove more than a small fraction.

(2) The strength of adsorption varies with the type of organism. Some are lightly adsorbed. Others are strongly adsorbed. Adsorption of the organism is specific for a surface.

(3) Of the bacteria studied, *M. aureus* was most difficult to remove from a given surface. *E. coli* was the easiest to remove.

(4) Percentage removal of *M. aureus* in the absence of soil from china, glass, and steel surfaces, with standard detergency and temperature conditions, fell between 97 per cent and 99+ per cent. Under similar conditions, removal of the same organism from plastic and aluminum surfaces was between 56 per cent and 84 per cent. In the case of plastic eating surfaces, a large variation existed among the different types. This variation did not exist between the china or glass surfaces.

(5) With *E. coli*, in the absence of soil, the ease of removal increased for all the surfaces. The removal efficiency varied between 99 per cent and 99+ per cent for china, glass, and steel and between 90 per cent and 98 per cent for plastic and aluminum.

(6) When the bacteria were mixed with an organic soil, the efficiency of removal increased markedly for all surfaces. When the bacteria were overlaid with the organic soil, efficiency of removal from plastic surfaces dropped quite markedly in relation to china, glass, and steel.

(7) When plates were worn or scratched, removal efficiency decreased for all surfaces, but the same relation existed between different surfaces as with the unworn surfaces. See Fig. 1.

(8) In respect to bacterial film build-up from repeated bacterial soiling and washing, the plastic surfaces exhibited a soil build-up many times that of china before saturation was reached.

Current Statistical Position of Glass

Employment and payrolls: Under the revised series recently set up by the Bureau of Labor Statistics, data on employment and payrolls will now be available for publication in THE GLASS INDUSTRY in an industry breakdown rather than for the glass industry as one segment. Statistics will be presented for Flat Glass, Glass and Glassware—Pressed and Blown, and Glass Products Made of Purchased Glass. In addition, these employment series have been adjusted to first quarter 1951 bench-mark levels indicated by data from government social insurance programs. Below are given these data starting with January 1953.

Employment—*Flat Glass:* January, 31,900 persons; February, 31,800; March, 31,300; April, 31,000. *Glass and Glassware, Pressed and Blown:* January, 86,500 persons; February, 87,700; March, 90,600; April, 91,800. *Glass Products Made of Purchased Glass:* January, 14,900 persons; February, 14,700; March, 15,200; April, 15,400.

Payrolls—*Flat Glass:* January, $13,758,364; February, $13,529,204; March, $13,514,505; April, $13,453,483. *Glass and Glassware, Pressed and Blown:* January, $24,045,558; February, $25,169,608; March, $26,555,464; April, $26,982,774. *Glass Products Made of Purchased Glass:* January, $3,877,874; February, $3,834,740; March, $4,029,064; April, $4,022,018.

Glass container production, based on figures released by the Bureau of Census, rose 6.9 per cent during May 1953 to reach 11,001,971 gross. This is an increase over the 10,290,720 gross produced during April. Production of glass containers during May 1952 were 10,219,364 gross, which is 7.6 per cent under May this year. During the January-May 1953 period, glass container manufacturers have produced a total of 50,282,542 gross. This is 7.2 per cent ahead of the 46,866,128 gross produced during the same period in 1952.

Shipments of glass containers during May 1953 also jumped to reach 10,753,724 gross. This is 13.8 per cent above the 9,442,688 gross shipped during April. During May 1952 shipments of glass containers were 10,127,697 gross, which is 6.1 per cent below May this year. Glass container manufacturers have shipped a total of 49,996,616 gross at the end of the first five months of 1953. Compared with the 46,120,371 gross shipped during the corresponding 1952 period, 1953 shipments are running 8.4 per cent ahead of 1952.

Stocks on hand at the end of May 1953 were 9,909,242 gross, which is 1.7 per cent higher than the 9,740,640 gross on hand at the end of April and .3 per cent higher than the 9,871,257 gross on hand at the end of May 1952.

Automatic tumbler production during April 1953 was 6,028,661 dozens. This is 11 per cent lower than the 6,777,783 dozens produced during March. During April 1952, production was 4,701,238 dozens. Shipments also fell off, though only .3 per cent, to reach 5,885,676 dozens. This is below the 5,907,810 dozens shipped during March. Shipments during April 1952 were 4,986,782 dozens. Stocks on hand at the end of April 1953 were 10,581,964 dozens. This is 3.4 per cent more than the 10,230,080 dozens on hand at the end of March. April 1952 stocks were 9,892,475 dozens.

Table, kitchen, and household glassware: Manufacturers' sales of machine-made table, kitchen, and household glassware during April 1953 were 3,549,110 dozens. This is 3.2 per cent less than the 3,667,047 dozens sold during March. Sales during April 1952 were 3,471,710 dozens. At the end of the 12-month period ending April 1953, manufacturers' sales were 41,878,297 dozens, which is 8.9 per cent higher than the 38,453,574 dozens sold during the corresponding period in 1952.

GLASS CONTAINER SHIPMENTS

(All Figures in Gross)

Narrow Neck Containers	May, 1953
Foods	1,283,745
Medicinal & Health Supplies	993,040
Chemicals, Household & Industrial	666,847
Beverages, Returnable	950,787
Beverages, Non-returnable	198,389
Beer, Returnable	326,940
Beer, Non-returnable	784,326
Liquors	739,248
Wines	301,157
Toiletries & Cosmetics	564,083
Sub-total (Narrow)	6,808,562
Wide Mouth Containers	
Foods	*2,741,078
Dairy Products	209,885
Medicinal & Health Supplies	284,716
Chemicals, Household & Industrial	148,787
Toiletries & Cosmetics	142,379
Packers' Tumblers	168,101
Sub-total (Wide)	3,694,946
Total Domestic	10,503,508
Export Shipments	250,216
TOTAL SHIPMENTS	10,753,724

* This figure includes Home Canning.

GLASS CONTAINER PRODUCTION AND INVENTORY

(All Figures in Gross)

		Production May 1953	Stocks May 1953
Foods; Medicinal & Health Supplies; Chemicals, Household & Industrial; Toiletries and Cosmetics	Narrow Neck	3,854,477	3,380,371
	Wide Mouth	*3,311,491	*3,183,906
Dairy Products		227,186	313,837
Beverages, Returnable		937,300	1,039,189
Beverages, Non-returnable		188,064	141,643
Beer, Returnable		357,801	265,318
Beer, Non-returnable		859,731	467,958
Liquors		723,108	693,778
Wines		356,831	291,983
Packers' Tumblers		185,982	131,259
TOTAL		11,001,971	9,909,242

* This figure includes Home Canning.

Description	% 1952 vs 1951	1952	1951
Auto. Machine Made Tumblers	55.1	$3,624,724	$6,584,390
Dozen	43.6	5,731,567	13,141,121
Average Price per Dozen	126.1	63.2¢	50.1¢
Hand Made Tumblers & Stemware	43.5	$ 27,807	$ 63,979
Dozens	28.7	8,180	28,527
Average Price per Dozen	151.5	$ 3.399	$ 2.243
Auto.Machine Made Table, Kitchen and Cooking Ware	84.1	$6,069,180	$7,216,994
Dozens	76.1	6,246,206	8,212,326
Average Price per Dozen	110.6	97.2¢	87.9¢
Hand Made Table & Kitchen	77.8	$ 284,805	$ 366,064
Dozens	53.9	55,165	102,279
Average Price per Dozen	144.2	$ 5.162	$ 3.579
Lamp Chimneys & Lantern Globes	69.5	$ 512,586	$ 737,289
Globes & Shades (Lighting)	104.4	$1,786,914	$1,711,507
Glassware Chemical, exc.Lab.Tub.	96.0	$2,378,370	$2,477,995
Elec. Glass Insulators	109.2	$ 320,296	$ 293,275
Glass Tubes,Tubing,Rods,Canes	61.0	$2,018,322	$3,308,709
Elec. Light Blanks	67.7	$1,277,298	$1,887,845
Glass Electron tube Blanks		$1,220,241	
Glass Products N.E.S.	107.7	$3,285,876	$3,050,484

Export statistics: A sharp drop in U. S. exports of automatic machine-made tumblers and a little more than 15 per cent decrease in automatic machine-made table, kitchen, and cooking ware shipments were revealed in the recently released Department of Commerce export statistics for glass shipments for 1952.

In general, the tendency for the entire Pressed and Blown industry is downward and it is felt that European and Japanese competition is greatly responsible for this declining trend in exports to markets previously supplied by United States manufacturers. U. S. currency difficulties is considered to be a contributing factor in the loss of business in the export field.

NEW NATIONAL BUREAU OF STANDARDS REPORT

Method for Determining the Resolving Power of Photographic Lenses, by Francis E. Washer and Irvine C. Gardner, National Bureau of Standards Circular 533, (supersedes Circular 428), 27 pages, 17 figures, 13 tables, $1.00. (Order from Government Printing Office, Washington 25, D. C.)

This circular provides the photographer with two sets of charts by which the resolving power of a photographic lens may be numerically measured with respect to a definite scale of values. It gives a detailed description of the procedure and technique to be followed in order that comparable values may be obtained by different observers in widely separated laboratories. The average amateur photographer can use this simple objective method with the equipment that he normally has available or may readily obtain, and it may also be applied to the testing of goggle lenses for definition and prismatic power and of telescopes and binoculars for definition.

The range of the charts is from 12 to 80 lines/mm. The six charts of one set are high-contrast charts, printed in black ink on a white background; the six charts of the other set are low-contrast charts, printed in gray ink on a gray background. The charts were made by the Bureau of Engraving and Printing in accordance with detailed specifications relating to width of lines and steps between patterns. Use of a process identical with that employed in the printing of postage stamps insured exact duplications of the test patterns. Additional sets of the charts, published as Supplement to NBS Circular 533, may be obtained for 75 cents from the Government Printing Office.

In preparing the present circular, the authors considered the gains that have taken place in the science of applied optics during the twelve years since Circular 428 was issued and revised that circular accordingly. The present circular contains test charts improved with respect to ease of deciding whether or not a given pattern is resolved and greater precision in the rating of lenses because the ratio of change of size between patterns has been reduced from the square root of two to the fourth root of two.

FRED FRALEY RETIRES FROM DIAMOND ALKALI

Fred W. Fraley retired on July 1 as a Vice President of Diamond Alkali Company, it has been announced at company headquarters. He resigned recently as a Director of the company.

Mr. Fraley's 25-year career with Diamond began in 1928 as Manager of Diamond's Southwest Sales Office in Houston, Texas. In 1943 he become Vice President—Sales, and has served as a Director since 1947. He was also a Director and former Vice President of The Chlorine Institute.

Always active in the chemical industry's relationship with the government, Mr. Fraley recently served with the National Production Authority under the "loan" plan whereby industry executives are recruited for temporary periods. At the time he concluded his nine months of service in December of 1952, Mr. Fraley was Assistant Administrator of N. P. A. in charge of the Chemical, Rubber & Forest Products Bureau. During World War II, he was a member of the W. P. B. and Munitions Board industry advisory committees.

GLASS PAPER PRODUCTS

Papers made of extremely fine fibers of glass are being used in a variety of industrial specialty applications, Owens-Corning Fiberglas Corporation has announced.

These incombustible, inorganic industrial papers are being used for the filtration of hot and/or corrosive air, gases, and liquids. They are also finding application as base sheets in specialty electrical laminates, as gasketing material, and as plate separators in aircraft and other special batteries. In such applications, the inherent high temperature resistance and excellent electrical-chemical properties of the product are very desirable. Many other possible uses are visualized by the company but have yet to be fully explored.

Owens-Corning Fiberglas Corporation sells the fibrous glass in its wool form to the various paper companies who process the fibers and manufacture the finished paper product into the customers' requirements.

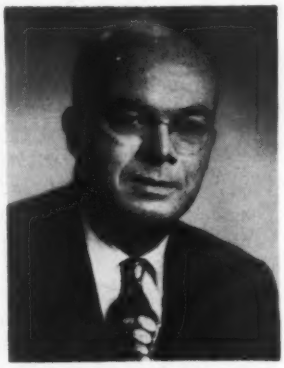
A.C.S. CENTRAL OHIO SECTION MEETING

The Central Ohio Section of the American Ceramic Society held its June meeting at which was featured a panel discussion on kiln firing, led by Clair R. Oberst, Industrial Ceramic Products, Inc.; Dudley P. Frame, Harrop Ceramic Service Company; and Jack Morris, Ceramic Supply Company.

OWENS-ILLINOIS TO CONSTRUCT NEW TECHNICAL CENTER

Announcement has been made by Owens-Illinois Glass Company of the construction of a new Technical Center in Toledo, Ohio, that will consolidate its general research program with the engineering activities of its various divisions.

"When completed, it will be one of the most advanced technical centers in the glass industry," said Oscar G. Burch, Vice President, research and engineering, who helped plan the Center and will direct its operations.



O. G. Burch

Broadly, the aims of the Owens-Illinois general research and engineering program are to develop new methods of making and using glass, while, at the same time, improving present processes and products. Study of materials and processes used in the manufacture of various Owens-Illinois non-glass products is also part of the program.

Work will start immediately on the new Center, which will occupy a 270 ft. by 480 ft. area in the western section of the city. It is scheduled for completion in the Fall of 1954. A pilot plant, now located on the site, will be incorporated into the new building.

The Center will be mainly a two-story structure occupied by offices, drafting rooms, and laboratories. The pilot plant area, to the rear of the building, will be of one-story construction.

Emphasis is on versatility and adaptability. Lightweight interior partitions are demountable so that office space can be readily converted into laboratories or vice versa as the need arises. Rooms of various sizes can be created temporarily to meet the demands of the work.

The pilot plant area is also flexible in design and has a minimum of partitions. One section, devoted to hot glass operations, will house several furnaces of 25-ton capacity each, forming machines, and other installations to be found in plants serviced by Owens-Illinois research and engineering. The rest of the pilot plant area will house machine, electrical, and pattern shops and the areas devoted to development work.

There will be an employee recreation room and cafeteria in the basement and off the cafeteria a paved, landscaped courtyard 70 x 80 feet resembling a walled garden. When completed, the Center will be occupied by 350 Owens-Illinois engineers, scientists, and technicians.

INDUSTRIAL DIAMOND ASSOCIATION BOOKLET

The Industrial Diamond Association of America, Inc., at its Annual Meeting and Convention, launched a new publication.

The booklet, entitled "The Diamond That Pays for Itself," is well illustrated to show the applications of industrial diamonds in ways curious to many, and throughout all segments of the industry. Sixteen short tabloid pages are filled with much information.

COMMENTS ON "ELECTRICAL GLASS MELTING"

The Editor
The Glass Industry

The article on "Electrical Glass Melting" by Dr. I. Horowitz, which appeared in THE GLASS INDUSTRY, February to April, 1953, is certainly interesting and timely. A great deal of basic work is therein reviewed, particularly with respect to European practice.

Several of the points about American practice, however, are not quite right, as follows:

The furnace shown in Fig. 18 was never built, even though the caption says it was. The actual form of the existing furnaces at Northwestern Glass Company include a melting area and throat, as shown, but with a very small refiner and a directly-connected single feeder-channel. The electrodes in the refiner are not used and there is an oil fire on top.

Since the electrode system is the heart of any electric furnace, it should be noted that the system shown was proposed more by E. S. Campbell of Northwestern Glass than by anyone else. The previous systems specified by Cornelius had failed in operation. Further, the power consumption figures cited are well on the optimistic side.

On Page 205, the inference might be drawn that the plan of using a combination of electrical and fuel heating originated in Switzerland during World War II. However, a U.S. patent, No. 1,944,855, covering this subject fully, was issued to Wadman in 1934. It expired in 1951.

Molybdenum electrodes have been developed and used much more extensively here in the United States, apparently, than they have been in Europe. In the writer's experience, they are cheaper to install and operate than graphite electrodes because of their much higher electrical conductivity. They are so small that water cooling them to prevent oxidation takes very little heat away from the furnace. Similarly, since they present a much smaller area to the glass than carbon electrodes do, discoloration of the glass due to electrodes has not been a problem, even in high-quality flint container glass.

Again, thanks to Mr. Horowitz for an interesting article.

Larry Penberthy
Penberthy Instrument Company, Inc.

THREE-YEAR EXPANSION PROGRAM AT L-O-F NEARS COMPLETION

Production of polished plate glass by Libbey-Owens-Ford Glass Company will be substantially increased in the late months of 1953 as a result of a three-year expansion program at three of its major plants, according to a statement by G. P. MacNichol, Jr., President.

The new twin-grinding plants at Rossford, which will tie into the two large tank furnaces there, while not themselves increasing the over-all supply, are expected to furnish a larger volume of high quality glass suitable for mirror glass, as well as for a number of precision products for the Armed Forces.

The completion of construction of a new tank furnace at Ottawa, Illinois, which doubled the plate glass blank capacity at that large plant, is a major step in increased output. Work also will soon be completed on the widening of Grinding and Polishing Line No. 2 and additional laminating facilities at the East Toledo plant. The polishing lines at Rossford will also be improved and expanded.

New Equipment and Supplies

PORTABLE POLISHER

Glass Center Enterprises, Inc., 128 Summit Street, Toledo 4, Ohio, has announced the development of a new, light, portable polisher for removing light scratches from glass, together with supplies and directions to put it into immediate use.

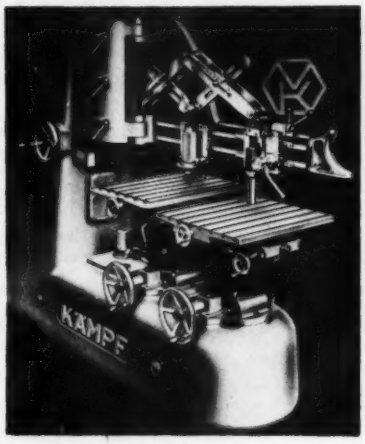
The new polisher weighs only seven pounds and is just nine inches over-all length, yet it is a rugged, industrial tool, according to the manufacturer. The unit is powered with a universal a-c or d-c motor for 115-volt operation using 6 amperes. There are two handles, a main gun type handle with power lead-in, and a second handle at right angle to permit ease of balance and control of pressure in the operation of the tool.

A white wool felt polisher head, three inches in diameter and 1¾ inches thick, fits tightly into a precision machined adapter which screws onto the main drive shaft of the motor. A sample container of cerium oxide and a tube of cement for mounting the polisher felt in the adapter come with the unit.

AIR AND GAS PROPORTIONER

The North American Mfg. Company, 4455 East 71st Street, Cleveland 5, Ohio, has announced its Series 630 Proportioner, a relay-controlled air-operated cross-connected governor designed to meet the need in many industries for an inexpensive device to accurately proportion large quantities of low pressure gas and air used for combustion.

The proportioner may be installed in either a gas or an air line of any standard pipe size ranging from 4 through 16 inches. It consists of a butterfly valve operated by an air motor and controlled by a relay receiving pressure impulses from both the gas and air lines. The valve is non-directional so the gas or air may be passed through it in either direction. The proportioner may be mounted in either a horizontal or vertical run of pipe.



MOLD COPYING MILLING MACHINE

Michael Kampf AG., Maschinenfabrik, Frankfurt am Main, Germany, has patented a vertical arrangement of the pantograph of the FK2 mold duplicating milling machine.

Advantages included are the swivel arm, which carries the pantograph with the milling spindle held exactly vertical in cross slides and the duplicating pin held in the same manner, absorbs a great part of the cutting pressures which arise. This vertical guidance is achieved without any additional guide elements provided with joints and makes it possible to mill perfect steep flanks; this is not always possible with a pantograph arranged horizontally as in the customary type of construction. The swivel bearing and the critical cross-sections of the swivel arm are of such generous dimensions that the maximum cutting pressures will not cause the arm to buckle or to vibrate. This arrangement spares the bearings of the pantograph swivel points, which can be adjusted free of play. It ensures accurate-to-size duplicating milling with this machine, together with an extremely long service life. The pantograph is adjustable within limits of reduction in size of from 1.5 to 4 times.

NEW CORRUGATED BOARD

The Hoerner Corporation, Keokuk, Iowa, has announced the introduction of two new products—polyethylene coated and polyethylene laminated corrugated board. These combinations of materials offer the unusual properties of polyethylene film, plus the natural strength of corrugated board.

The special properties of polyethylene include low moisture-vapor transmission, resistance to most chemicals, freedom from odor, taste and toxicity, and flexibility of the film at very low temperatures.

CATALOGS RECEIVED

Columbia-Southern Chemical Corporation, 420 Duquesne Way, Pittsburgh 22, Pa., has published "The Columbia-Southern Story," which reviews and highlights the company's activities.

After a brief introduction, the publicity piece discusses Columbia-Southern products, with photographs of various operational details. Following this is a discussion of how the company's products are made. The facilities of the technical departments are highlighted and some laboratory processes illustrated.

Ceragraphic, Inc., 250 South Street, Newark 5, New Jersey, sole United States distributor of Dubuit Machines (Paris, France), is distributing a catalog featuring this equipment.

Presented in four languages, the catalog illustrates and discusses the line of printing machines manufactured by this company. Among the machines discussed are printing machines for objects in general, machines to enamel and print cases and collapsible metal tubes, machines for printing pharmaceutical ampuls, high speed printing on various objects, printing of awkward shaped objects, hand machine for printing cylindrical objects and for conical objects, semi-automatic machine for printing cylindrical and conical objects, etc.

Pennsylvania Salt Mfg. Company, Corrosion Engineering Department, 1000 Widener Building, Philadelphia 7, Pa., has prepared a comprehensive chart showing the resistance of seven classes of corrosion resistant cements to 297 of the most generally used corrosive chemicals.

The chart indicates that Pennsalt has a cement mortar which is resistant to the chemical attack of every one of these chemicals except sodium hypochlorite which, being an oxidizing agent on the alkaline side, will attack most materials at certain temperatures. The type of cement mortars listed in the chart are: Silicate—Penchlor; resin type—Pennsalt Furan, Pennsalt Asplit, Pennsalt HF, and Pennsalt PRF; and Sulfur—Pennsalt Sulfur and Pennsalt Carbon Sulfur.

The new chart is intended only as a ready guide for engineers, construction and maintenance men, and purchasing agents in selecting chemical resistant cements to meet their particular problems.

EXECUTIVE CHANGES AT OWENS-ILLINOIS

Owens-Illinois Glass Company has assigned three men new and increased responsibilities in its sales and marketing program.

Harold J. Carr, as Director of Business Research, will coordinate market studies, analyses, and forecasts on the national economy, the glass industry, and the industries served by Owens-Illinois. Henry C. Rudy has been named Director of Merchandising and will coordinate the merchandising activities of the company and its subsidiaries. E. L. Herron has been named Director of Advertising and will coordinate the advertising activities of the company and its subsidiaries. All three men will report to Smith L. Rairdon, Vice President and Director of Marketing.

Mr. Carr joined Owens-Illinois in 1942 and the following year was named General Manager of the Closure and Plastics Division. He has been a Vice President of the company since 1947. He served on the Glass Container Manufacturers Advisory Committee of the War Production Board from 1944 to 1946, and has held a number of important industry positions, including those of Chairman of the NRA Code Authority for the Closure Manufacturing Industry and Director of the Committee on Defense Activities of the Glass Container Industry.

Mr. Rudy, former Prescription Ware Sales Manager in the Glass Container Division, has been in container sales since he joined the company in 1934. Before transferring to the Toledo office, he served as a salesman and then as Manager of the New Orleans sales branch.

Mr. Herron has been advertising and merchandising manager in the Market Development Department of the Glass Container Division since 1948. He joined Owens-Illinois in 1937 and served in the Personnel Division for two years before he was assigned to advertising work.

Announcement has also been made of the naming of Helen G. Myers as Assistant Secretary of Owens-Illinois. The first woman officer in the company's history, Miss Myers joined Owens-Illinois as a stenographer more than 20 years ago. She left the glass firm to work in the stock transfer department of a bank, returning to Owens-Illinois in 1932 as head of its stock transfer department. In her new job as assistant to the Secretary-Treasurer, she will continue to keep tabs on the ownership of the company's 3,056,874 common shares and will have additional duties related to shareholder relations.

FOOD MACHINERY & CHEMICAL CORPORATION APPOINTMENT

Food Machinery and Chemical Corporation has announced the appointment of Alfred T. Loeffler as Assistant Vice President of its Chemical Divisions. Mr. Loeffler becomes administrative assistant to Ernest Hart, Executive Vice President of the Chemical Divisions, with headquarters at New York.

Well known in the chemical industry, Mr. Loeffler was for a number of years associated with the Hooker Electrochemical Company, following which he joined Monsanto Chemical Company, becoming General Branch Manager in New York. In 1951, he became Chief of the Chemical Branch of the Office of Price Stabilization in Washington. Returning to Monsanto, he was appointed Director of Development of the Organic Chemicals Division.

GEORGE UPDIKE OF PEMCO ELECTED OFFICER OF SOCIETY SECTION

George Updike of Pemco Corporation has been elected Chairman of the Baltimore Section of the American Society for Quality Control for the 1953-54 term.

This organization fosters exchange of technical information based on ideas and experiences in the application and use of quality control and its application to industrial processes.

Mr. Updike is in charge of quality control functions at Pemco Corporation.

L-O-F ENGINEERING STAFF CHANGES

Richard E. Warren, who served during World War II as a technical advisor on U. S. Navy minesweeping operations, has joined Libbey-Owens-Ford Glass Company as engineer in charge of the Electrical Section of the Engineering Department, William H. Hasselback, Director of Engineering, has announced. In his new position, Mr. Warren will work closely with L-O-F plant personnel in maintaining existing electrical power for glassmaking equipment and in planning new installation projects.

In 1939, upon his graduation from the University of Minnesota Institute of Technology with a degree in Electrical Engineering, Mr. Warren joined Westinghouse Electrical Corporation as a student test engineer. At the end of the war, he rejoined Westinghouse where he remained until recently going to L-O-F.

At the same time, it was announced that Paul L. Sellers, Jr., who has been in charge of industrial engineering at Libbey-Owens-Ford's Thermopane plant since late 1946, has been named plant industrial engineer at the Rossford factory. Mr. Sellers received his engineering education at the University of Akron and joined L-O-F in 1945. He has worked closely on a number of projects involving both Rossford and Thermopane plants.

Named to succeed Mr. Sellers as plant industrial engineer of the Thermopane plant is William G. Thielman. He was graduated from the University of Toledo in 1943 and joined L-O-F in 1946.

CONVEYOR GLOSSARY PUBLISHED

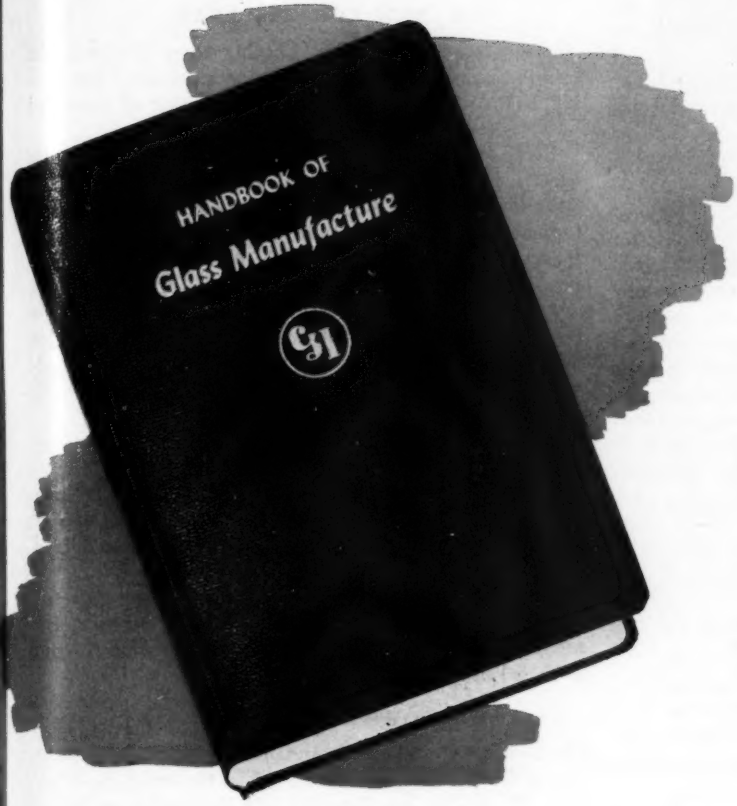
A new and revised edition of "Conveyor Terms and Definitions" is just off the press at the Conveyor Equipment Manufacturers Association, according to R. C. Sollenberger, Executive Vice President.

Fanciful words used to describe conveyors—such as grizzly, grasshopper, wishbone, mother, apron, etc.—are given their exact meaning for industrial specifications in this manual which lists 1500 terms and shows line drawings of more than 80 types of conveyors and parts.

"Conveyor Terms and Definitions" is available from the Association at 1 Thomas Circle, Washington, D. C., at $1.00 per copy.

It's *new*

and it's *different*



IT'S NEW because twelve years have passed since the first handbook for glass manufacturers was published and so much has taken place in the intervening years in technological and engineering development.

IT'S DIFFERENT because it is the only single volume where so much pertaining to all phases of glass manufacture will be found.

The NEW *Handbook of Glass Manufacture* is comprised of more than 500 pages of practical reference data . . . tables, charts, formulae, illustrations, and text. It is a primary working tool for plant executives, research heads, laboratory technicians, and engineers. It is a reference book that should be immediately available when you have a question or need a quick start to the solution of a problem. It is edited for glassmen by those who know glass.

Send for your *personal* copy now!

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The Glass Industry
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NAME .....

COMPANY .....

STREET ..... CITY ..... STATE .....

REPORT ON THE BRITISH GLASS INDUSTRY

Increasing competition, rising costs, and heavy taxation are the problems weighing on the glass container industry, and on the glass industry as a whole, in the United Kingdom.

Speaking on the position of the industry as Chairman of the United Glass Bottle Manufacturers, Ltd., L. A. Elgood, O.B.E., stated: "The general change to more difficult trading conditions which developed early in 1952 resulted in a reduced demand in the home market for glass containers and closures, and the intensity of competition in export markets increased and profit margins were drastically reduced by these events.

"Notwithstanding these adverse conditions, the group trading profit of £861,473, although substantially less than the record profit earned in 1951, came within the range of earnings of the other post-war years.

"The incidence of taxation at present levels and continuing advances in prices of coal, soda, ash, stores, and services impede our efforts to stabilize prices. Only reluctantly, and then to the minimum extent, shall we further increase our selling prices.

"The cost of exporting from our factories to overseas ports in no way compares with pre-war charges, and for the maintenance of export trade this is an alarming condition. Not only are we faced with the full blast of competition from Western Europe, but also severe competition from the new or growing glass industries established within those countries to which we have regularly shipped in the past. Within the past year such local production has been aided by payment difficulties, a shortage of sterling resulting in the substantial curtailment of the company's traffic with such traditional markets as Australia, New Zealand, and South Africa. Nevertheless, the company's export sales in 1952 were well maintained when compared with the record figures achieved in 1951. The outlook in the present year is not so favorable."

DIAMOND ALKALI COMPLETES DISTRIBUTION EXPANSION

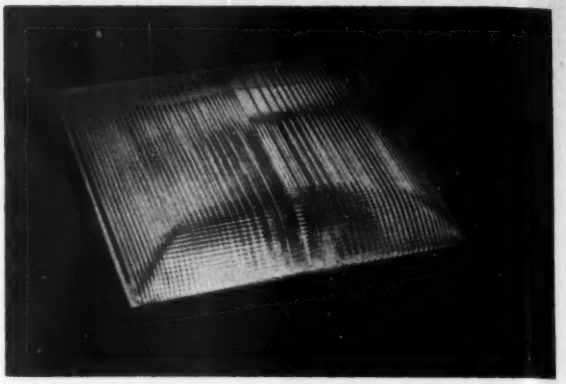
More extensive, centralized storage-and-handling facilities to serve Diamond Alkali Company's customers in New Jersey, New York, and surrounding areas have been completed and are now in operation at the company's Jersey City silicate plant.

In line with Diamond Alkali's continuing policy of increasing customer service, the new construction provides 24,000 additional square feet of storage space for packaged chemicals. It consists of a steel frame-transite siding structure 200 feet long by 120 feet wide. A masonry wing, 21 feet by 52 feet, attached to the east end, houses the employees' locker room, lunch room, service quarters, and office.

FRAZIER-SIMPLEX PRESIDENT ELECTED KERAMOS HONORARY MEMBER

J. Earl Frazier, President and Secretary of Frazier-Simplex, Inc., has been elected an honorary member of Keramos by the Pennsylvania State College.

Mr. Frazier is a past-President and a Director of the Pennsylvania Ceramics Association, Inc., and is also a member of the Phi Chi Mu and a member of Phi Beta Kappa.



NEW CORNING LENS

The newest contribution of Corning Glass Works to the lighting industry is a 10⅞-inch square prismatic lens specifically designed for incandescent lighting of extended areas, such as corridors, aisles, and counters.

Recently introduced to the trade, the new prismatic lens is known as Pyrex Corridor Lenslite. Projecting light into two long, high intensity beams along a longitudinal axis, the lens permits more even distribution of light over long areas with widely spaced fixtures than is possible with lenses projecting symmetrical patterns.

Extending slightly below the ceiling line, the new lens produces an area of light adjacent to the fixture, this minimizing brightness contrast between fixture and ceiling and presenting a pleasing visual effect.

W. E. LEVIS RECEIVES HONORARY DEGREE

William Edward Levis, Chairman of the Executive Committee of the Owens-Illinois Glass Company, was one of four persons who received an honorary degree at Alfred University's 117th commencement on June 8.

University President M. Ellis Drake conferred a doctor of laws degree on Mr. Levis. Mr. Levis served as assistant to the Chairman of the War Production Board from 1941 to 1942 and from 1944 to 1945.

BROCKWAY APPOINTMENTS

The Brockway Glass Company has announced the addition of G. R. Hollen to the staff of its General Line Division. Mr. Hollen was formerly with the American Stores and is well-qualified for the duties he has assumed.

Also announced was the appointment of R. Allen Gutherie to the Beverage and Liquor Divisions of its Sales Department. Mr. Gutherie will assist the Division Manager, E. M. Tyndall.

• The election of two executives of the Kimble Glass Company, subsidiary of Owens-Illinois Glass Company, as officers of two organizations has been announced. E. J. Rhein, Sales Manager of the Scientific Division of Kimble, was elected Chairman of the laboratory apparatus and optical section of the Scientific Apparatus Makers Association. Vern L. Larson, Regional Manager in the Minneapolis office of the Insulux Glass Block Division of Kimble, has been named President of the Minnesota-Dakota Chapter of the Producers' Council, Inc., a national organization of manufacturers in the building materials and equipment field.

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Rock Quartz	Aplite	Flint	Beryl
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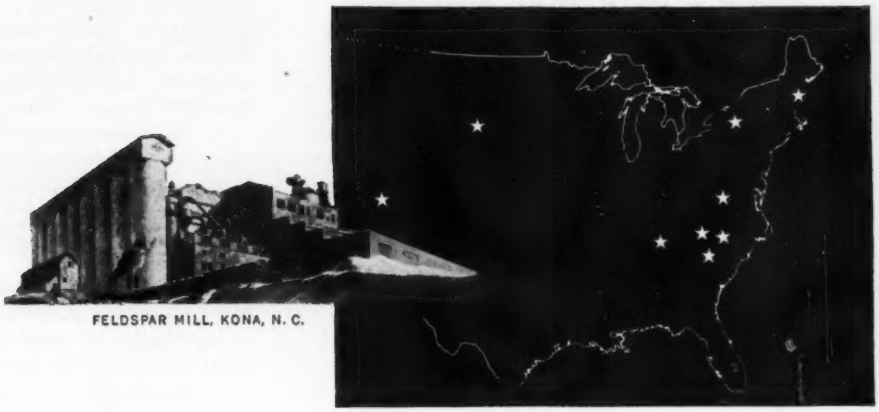
Kona, N. C. • Lunday, N. C. • Piney River, Va.
Rochester, N. Y. • Spruce Pine, N. C. • Topsham, Maine



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For 60 years, Consolidated has been producing feldspar with the extras that have made it the first choice of the glass, pottery and porcelain enamel industries.

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EXTRA —you always get the tonnage you want when you want it, because of large production at many mills.

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EXTRA —you get positive quality control because of Consolidated's long time experience in feldspar analysis at modern laboratories which serve all plants.

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EXTRA —you always get helpful, understanding cooperation from Consolidated's mills and offices through an organization of men who are technically qualified to serve you well.

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Glass-makers like our SODA ASH!

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Assurance is the premium you receive — at no extra cost — when you buy Wyandotte Soda Ash. This assurance is a priceless quality that will pay off for you over the years. It comes to you in four important ways:

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2 **Assurance of uniformity and high quality** through closely controlled production. Constant testing throughout the production process maintains rigid uniformity in each of the many grades of Wyandotte Soda Ash, carload after carload!

3 **Assurance of prompt, economical delivery** because of Wyandotte's central location and easy accessibility to railways and truck lines. Wyandotte Soda Ash is as convenient to you as your telephone!

4 **Assurance of skilled technical help** whenever you require it. Wyandotte, with 63 years of helpful service to the glass industry, has research and technical service staffs anxious to work with you!

Yes, many glass manufacturers have chosen Wyandotte as their source of soda ash supply . . . and for the premium of *assurance* that goes with it . . . year after year. Why don't you do the same? For further information on grades available, shipping data and technical service, contact Wyandotte . . . your inquiry will receive our prompt attention. *Wyandotte Chemicals Corporation, Dept. G, Wyandotte, Michigan. Offices in principal cities.*

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CHEMICALS

HAROLD OSWALD FORMS NEW COMPANY

Oswald Refractories Company, Inc., a new corporation, has been formed by Harold Oswald and Associates to act as exclusive sales managers for Alsey Brick and Tile Company, Alsey, Illinois, manufacturers since 1905, and special sales representatives for the Wellsville Fire Brick Company, Wellsville, Missouri, manufacturers since 1918, as well as St. Louis and Southwestern sales representatives for Vesuvius Crucible Company, Swissvale, Pa., manufacturers since 1916 of crucibles, stopper heads, and graphite refractories for steel mills, ferrous and nonferrous foundries.

Harold Oswald

Mr. Oswald, who is President and Treasurer of the new corporation, was formerly Vice President, Sales Manager, and a Director of Walsh Refractories Corporation, having been associated with that firm for over 20 years.

On June 1, Harry C. Hampe, formerly connected with Walsh Refractories Corporation joined the Oswald Refractories Company, Inc., as their Vice President.

The personnel of Oswald Refractories Company has a background of over 30 years of experience in the refractory industry and has specialized in sales and service activities. Headquarters of the new firm are in the Meramec Building, 117 N. Meramec, St. Louis 5, Missouri. The sales territory will comprise all of the Middle West and Western states, in addition to foreign trade.

VITRO ELECTS PRESIDENT AND BOARD CHAIRMAN

The boards of directors of The Vitro Manufacturing Company, Vitro Corporation of America, and Vitro Chemical Company, have announced the election of J. Carlton Ward, Jr., of Farmington, Conn., as President of the corporations. Mr. Ward was also made a Director of the companies, which he is joining for the first time. Albert L. Baker, former President and later Chairman of the Boards, died early in May.

At the same time, Charles S. Payson of New York, industrialist who has been associated with the Vitro companies since their reorganization, was elected Chairman of the Boards of Directors.

Mr. Ward has been an outstanding engineer and executive, and in recent years has been prominent in the aircraft industry. From 1935 through 1940 he was Vice President and General Manager of the Pratt & Whitney Engine Division of United Aircraft Corporation. From that date until 1949 he was President, and later Chairman of the Board of Fairchild Engine and Airplane Corporation. From 1949 to 1953 he has been Chairman of the Board of Thompson Industries, Inc. of Boston, Mass., and has been engaged as a business consultant.

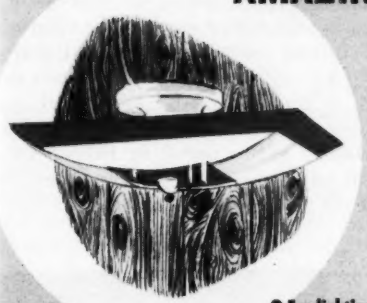
Mr. Payson is Chairman of the Board of Refined Syrups & Sugars, Inc., a Director and member of the executive committee of Armco Steel Corp., of Middletown, Ohio, and the Reed-Prentice Corporation of Worcester, Mass.

• For glassware

• For glass containers

a sensational VITRO development . . .

AMAZING, INSTANT-DRY Thermo-Glo Thermoplastic Colors



• For lighting ware

• For hot application at low temperatures! • Dry immediately!
• Provide sharper decorative detail! • Assure fewer screen marks!

¶ Here's a line of Vitro Colors that provide the answer to your requirements for superior ware with maximum eye appeal and a minimum of rejects.
¶ With these newly-developed "Thermo-Glo" thermoplastic colors, you're assured sharp, clear detail—free of undesirable screen marks. You screen them hot at operating temperatures as low as 140° F. without any blistering of color whatsoever. Once applied, *"Thermo-Glo" Colors dry immediately,* thus eliminating the trouble and expense of using a drier between applications.
¶ Actual production tests have proved Vitro "Thermo-Glo" colors to be the finest ever developed for silk or metal screen application. We'll be glad to give you complete details on request or arrange a demonstration at your convenience.

• For dinnerware

Vitro's "Thermo-Glo" Colors also give unsurpassed results when used as over-glaze china colors and for silk screen application on porcelain enamel.

Colors by VITRO

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Sales Offices In Principal Cities

HOWARD BAHR NAMED TO DIRECT CORNING'S DISPLAYS

Howard E. Bahr, Assistant Director of Public Relations at Corning Glass Works, has been appointed Director of Displays and Exhibits, according to an announcement by President William C. Decker. Named as Manager of Public Relations is John T. Lanahan.

Mr. Bahr, in his new position, will direct the company's institutional and product display activity at national trade shows, sales conferences, and all company offices and plants, including The Hall of Science and Industry at the Glass Center in Corning. Mr. Bahr, a graduate architect, joined Corning in 1934 as a designer in the company's architectural glass department in New York. Two years later, he was made Sales Manager of that department. In 1937, he directed the development and construction of the firm's exhibition for the New York World's Fair. He later was named Manager of the Steuben Glass retail shop in Chicago, and in 1939 became head of the company's product design group in New York. In 1941, he became Manager of the Ornament and Novelty Sales Department in Corning. He entered the Army in 1942 and upon his discharge in 1946 as a Captain, rejoined Corning as Manager of the Public Relations Department. In 1952, he was appointed Assistant Director.

Mr. Lanahan joined Corning Glass Works in 1944 and has served principally in the areas of employee communications and community relations in the company's plant towns. Last January, Mr. Lanahan was appointed Editor of Corning's employee magazine, "Gaffer News."

A PRECISE ANGULAR STANDARD

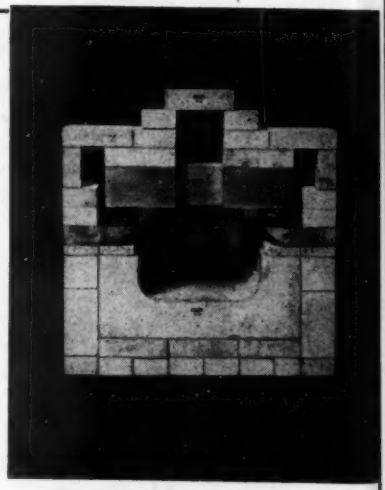
A 24-sided polygon of exceptional accuracy has been constructed by C. E. Haven and A. G. Strang of the National Bureau of Standards to serve as a basic standard of angular measurement. Made of precisely machined and polished gage blocks accurately positioned at measured angular intervals on a circular base plate, the NBS polygon permits the comparison of an "unknown" angle with consecutive angular intervals until the total of such intervals equals an integral number of perfect 360-degree angles.

The polygon was designed primarily for use in the calibration of the 15-, 30-, and 45-degree angle blocks of the master sets which industry uses to control the shape—and hence the interchangeability and proper functioning—of mechanical parts produced by mass production methods. However, the principle of the device is expected to find considerable application in the routine angular measurement work of the optical and mechanical industries.

• Canadian Pittsburgh Industries Limited has been granted supplementary letters patent in Ottawa for the purpose of increasing the capital stock of the company to 70,000 non-participating redeemable preferred shares of the par value of $100 each and 200,000 common shares without nominal or par value. Also announced is that Pilkington Brothers (Canada) Limited has been granted federal supplementary letters patent in Ottawa for the purpose of increasing the capital stock of the company to 50,000 shares of the par value of $100 each.

Cleaner Glass, Low Maintenance

with **CRYSTALITE Forehearths**



REMMEY CRYSTALITE (mullite-bonded mullite) is produced in all shapes necessary to make up the forehearth assembly. Burner blocks, cover blocks, channels, spouts, tubes, plungers and orifice rings are built to meet specified requirements. These CRYSTALITE parts mean better, more efficient production by offering:

★ Accuracy in formation to eliminate time-wasting adjustments.
★ High refractoriness and erosion resistance for longer life, fewer replacement shutdowns and cleaner glass.
★ Rigid control through each production phase for uniform quality and dimension accuracy.

Get Premium Performance Without Premium Price . . . by using REMMEY CRYSTALITE parts for your forehearth.

Dependable Refractories

REMMEY

RICHARD C. REMMEY SON CO.
Philadelphia 37 • Pennsylvania

NEW VISCOSITY STANDARD ADOPTED

Beginning on July 1, 1953, the National Bureau of Standards has adopted the value of 0.01002 poise for the absolute viscosity of water at 20°C. as the primary standard for the calibration of standard viscosity samples and viscometers. The date originally proposed for this change was July 1, 1952, but, at the request of the American Society for Testing Materials and the International Organization for Standardization, the adoption of the new value for water was deferred for one year in order that the ASTM and ISO members could make the change simultaneously with NBS. The ASTM, the National Physical Laboratory in England, and the Physikalisch-Technischen Bundesanstalt in Germany have indicated that they will also adopt the value of 0.01002 poise on July 1, 1953.

Up to the present time the value of 0.01005 poise for the absolute viscosity of water has been used widely as the primary reference standard. The use of the new value of 0.01002 will result in a reduction of 0.3 per cent in the measured values of viscosity and will make viscosities reported in absolute units correspondingly more accurate. Previously published data based upon 0.01005 poise may be adjusted to the new standard by reducing the published values by 0.3 per cent.

AIRCO APPOINTS TECHNICAL DEVELOPMENT DEPARTMENT MANAGER

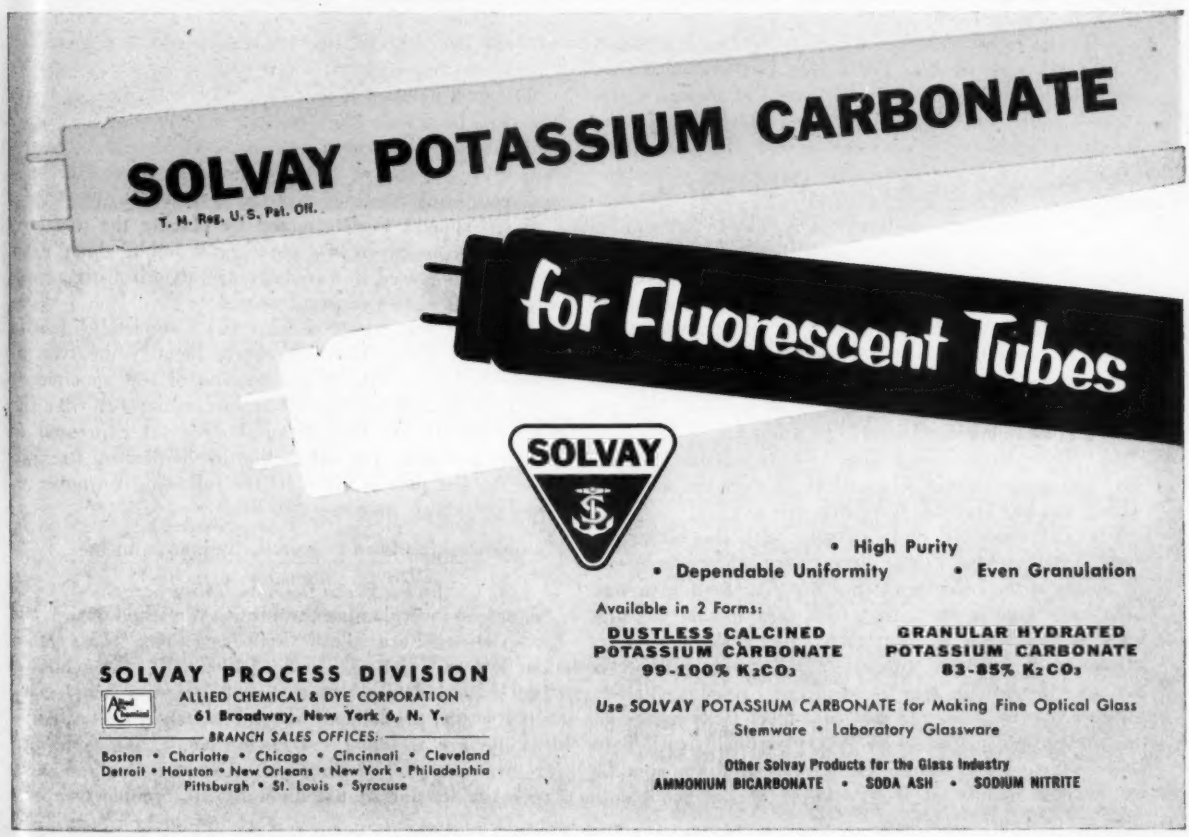
H. L. Ingram, Jr., Air Reduction Sales Company's special representative in Washington, D. C., has been appointed Manager of the Technical Development Department of the firm, it was announced by H. F. Henriques, Vice President. Included in the Technical Development Department are four sections—Aircomatic, Metallurgical, Technical Market Development, and Process Development Laboratory.

Mr. Ingram has been with Air Reduction for 18 years. For five years he was with the Applied Engineering Department, another five with the Gas Sales Department, and eight years as special representative with offices in Washington, D. C., a post he held until this appointment.

• Eugene H. Cunningham, a chemist in the glass technology section of the Research Department of Libbey-Owens-Ford Glass Company, was recently one of 30 senior students at the University of Toledo initiated into the Phi Kappa Phi honorary fraternity for outstanding scholastic achievement.

• Harlan Hobbs, Sales Promotion Manager for Kimble Glass Company, subsidiary of Owens-Illinois Glass Company, acted as Chairman and Moderator of the Public Information Forum at the 1953 meeting of the Scientific Apparatus Makers Association.

• Two new warehouses, one of 23,500 sq. ft. and the other of 17,000 sq. ft., will be built by the Westinghouse Electric Corporation at their Fairmont, W. Va. lamp plant. Part of the Lamp Division's program to increase storage facilities in all key centers, the new warehouses will be used for storage of fabricated glass. To be constructed of corrugated metal, the new buildings will cost approximately $165,000. General contractor's bids have been opened and J. M. Boor, Inc., of Carnegie, Pa., was the low bidder. The contract will be let shortly.


SOLVAY POTASSIUM CARBONATE
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for Fluorescent Tubes
SOLVAY
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Available in 2 Forms:
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Detroit • Houston • New Orleans • New York • Philadelphia
Pittsburgh • St. Louis • Syracuse

(*Continued from page* 364)

Fig. 7.

resin content of 20-25%. A typical mix ratio by weight is: 25 parts resin, 1 part catalyst, 74 parts acetone.

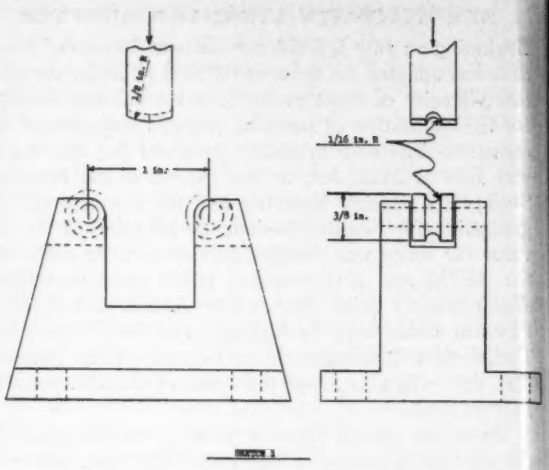
(3) Roving, silver or yarn shall be passed down into the resin solution and up and out over a roller or over a wiping guide at a lineal rate of 5 to 8 inches per second. This will permit the excess solution to run back into the vessel from the strand as it emerges. The glass is wound onto an open wire reel so that it is spaced without one strand touching another. (See Fig. 2.)

(4) The reeled, impregnated glass fibers are placed in a circulating air oven at 150°F. for 10 minutes. This is intended to produce a uniform removal of acetone and to remove water which may have been present in the materials or which may condense on the fiber due to the lowering of the dew point by the evaporation of acetone. (See Fig. 3.)

(4-a) Preliminary ignition loss is taken after drying. Approximately 1 meter of 6-end strand is carefully weighed and placed in a Coors wide-mouthed porcelain crucible. The crucible is then tilted over a Bunsen burner and a low flame applied until the fiber appears white, i.e., devoid of carbonaceous matter (bottom of crucible should barely show red heat). Ignition loss should be approximately 25-26%. Make two checks of ignition loss per each set of five test specimens to be prepared.

(5) The plastic coated fiber is next wound 25 times over two hooks (about 9" apart) to produce the specimen with 6-end 140's roving. (See Fig. 4.)

(6) The assembly of two hooks with the fiber-resin body is transferred to the wrapping machine, tensioned by means of the adjustment (See Fig. 5). One-fourth inch cellophane tape is wound on with care so that the first layer is comprised of each turn lapping the preceding, substantially one-half. (See Fig. 6.) A second layer is put over the first in opposite direction. It is essential to produce a cylindrical rod and care must be exercised in the wrapping operation to apply proper tension to achieve this end. Deviation from true cylindrical contour will consist mainly of the thickness of the cellophane showing as a spiral marking.



(7) The wrapped assembly is hung in a circulating air oven at 150°F. for one hour with a ½ pound weight attached. Cure is then completed in a similar oven at 250°F. for two hours. (See Fig. 7.) Note: Accurate adherence to the recommended procedures is essential to assure proper cure.

(8) Testing will be conducted in flexure on a 1" span. Rate of loading will be 0.25" per minute maximum. The supports and loading edges will correspond to Sketch No. 1. Failure of the test specimen occurs when the recording hand has reached its maximum.

(9) The test procedure for flexural strength will consist of determining the flexural value on the same test specimen in the dry, cured state and also after a four-hour immersion in boiling water. It is recommended that two dry strength and two wet strength tests be made on each test specimen.

The total number of specimens to be tested for any one size shall be at least 10.

Final resin content (ignition loss) should be determined on samples of the dry, cured portion of the test specimen using the areas adjacent to the break.

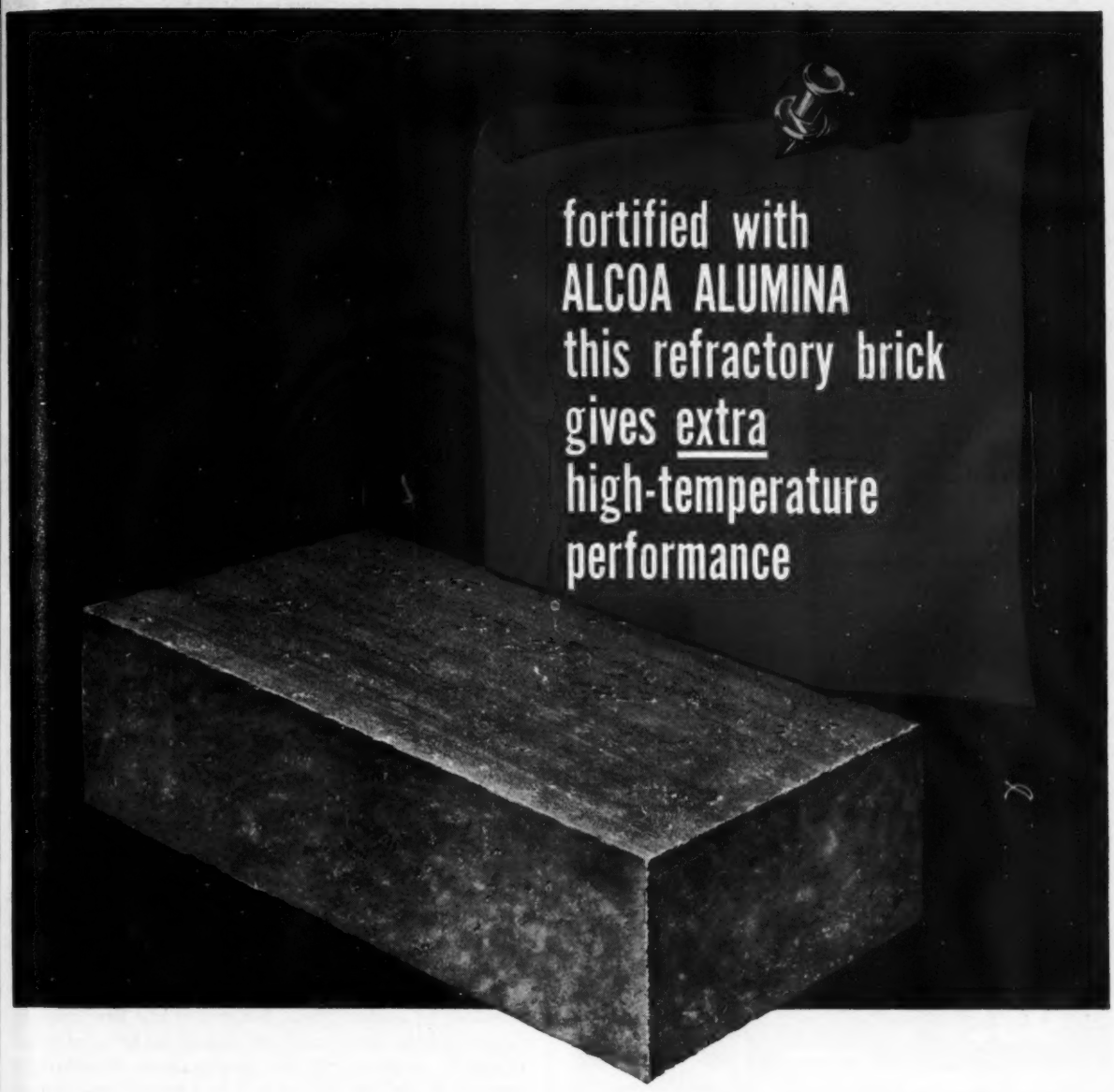
Resin content is determined by placing the dry portions of the specimen in a porcelain crucible which, after weighing, is placed in a cool furnace, then heating gradually to 1100°F. to a constant weight.

(10) The test report should: (a) Completely identify the type of fiber; (b) Completely identify the type of resin; (c) Give date of preparation of test specimens; (d) Give date of testing of test specimens; (e) Give the resin content; (f) Give flexural strengths expressed in psi, dry and wet. The calculation of the flexural strength from the test data is given by the following formula:

$$\text{Flexural Strength in psi} = \frac{\text{Breaking Load in pounds} \times \text{span in inches}}{.3928 \times (\text{diameter in inches})^3}$$

To assist in evaluating the proposed method of test, the Libbey-Owens-Ford Glass Company, Fiber Glass Division, Wayne Building, Toledo, Ohio, will make available upon request detailed drawings of the equipment necessary for the production of the test specimens. These drawings are as follows: Drawing No. 1, Sample Wrapper Assembly; 2, Resin Applicator and Container; 3, Creel Adapter and Mount Assembly; 4, Sample Wrapper

(*Continued on page* 392)



To meet the requirements of higher operating temperatures, manufacturers are fortifying their refractory mixes with more and more ALCOA Alumina. It's a *sure way* to improve performance and reduce costly down-time.

For instance, ALCOA Alumina gives refractories:

- **EXTRA strength and stability under load at high temperatures**
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- **EXTRA low porosity and shrinkage**

Furthermore, these performance characteristics *improve* in almost direct ratio to the alumina content of each refractory!

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Pennsalt Chemicals

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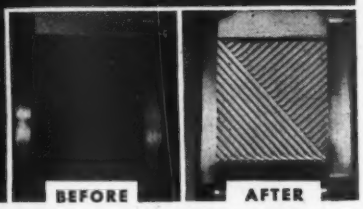
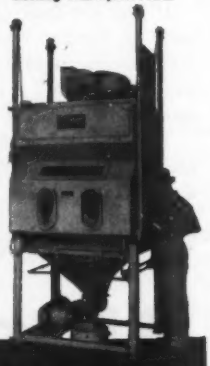


Complicated molds are easily cleaned and left *ready for use* with Pangborn Hydro-Finish! Hand cleaning and polishing is virtually eliminated! And you save additional time and labor because a Hydro-Finish machine, operated by one man, removes discoloration and scale in *minutes* instead of hours!

What's more, Hydro-Finish's use of fine-mesh abrasives suspended in liquid gives you a precision job. Sharp edges are maintained . . . tolerances are held to .0001 . . . molds last longer . . . precision equipment is protected.

Get complete facts on Hydro-Finish and how it can save *you* money! Write for Bulletin 1400-A to: PANGBORN CORP., 3400 Pangborn Blvd., Hagerstown, Md.

Actual unretouched photos of mold before and after cleaning with Hydro-Finish



Pangborn
BLAST CLEANS CHEAPER
with the right equipment for every job

EFFECT OF SIZES . . .

(*Continued from page* 390)

Details; 5, Sample Winder; 6, Resin Applicator; 7, Resin Container, Resin Applicator; 8, Creel Adapter Mount; 9, Sample Winder Support Frame; 10, Sample Winder Handle; 11, Sample Winder Assembly.

ANCIENT KOPIA GLASS . . .

(*Continued from page* 368)

TABLE II
Specific Gravity

Perforated round bead (quartz)	2.68
Perforated rectangular bead (quartz)	2.60
Fragment of glass bangle (same as item No. 5 of Table I)	2.51
Broken pieces of glass contained in a refractory vessel	2.53
Refractory piece	2.33

and Nalanda glasses also, as analyzed by Sanaullah, had low figures for the lime and magnesia content.

The alumina content of all Kopia glasses is unusually high as compared with the antique glasses analyzed by Neumann. This becomes all the more noticeable if Al_2O_3 and Fe_2O_3 are taken together, in which case the range becomes from 6.5% to 15.66%. Here again the Kopia glasses differ from all the Babylonian Assyrian glasses which have an alumina content of less than 3%. The glasses having higher percentages of alumina are few and they are all of Egyptian origin or from Roman samples of a considerably later age.

If it is assumed that were the knowledge of glassmaking in India derived from middle east sources, it was more likely to be through Babylonian Assyrian contacts, the above variations tend to acquire significance because they support the inference pointed out by Varshney for Taxila glasses, "that glass manufacture was not only well practiced in ancient India, but that it had developed independently in this country or even if the knowledge was originally acquired by the Indian from Middle East sources, by the time of Taxila it had existed long enough in this country for considerable progress along distinctive lines to have been made."

The writers' thanks are due to Mr. S. C. Majundar for his assistance in taking the photographs. The samples were very kindly obtained by Dr. Atma Ram, Director of the Institute, and the authors are grateful for such assistance.

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2. Antique Glasses Part II—B. Neumann, J. Soc. G. T. 1929, XIII, Abs. p. 85.
3. Antique Glasses Part III—B. Neumann, J. Soc. G. T. 1930, XIV, Abs. p. 104.
4. Antique Glasses Part IV—B. Neumann, J. Soc. G. T. 1929, XIII, Abs. p. 383.
5. Glass in Ancient India—Y. P. Varshney, Glass Industry, Dec. 1950.
6. Amrita Bazar Patrika (Sunday Edition-Allahabad)—14th August, 1949.

• The Libbey-Owens-Ford Glass Company's catalog, "Glass for Construction," was awarded an honorable mention in the 1953 Product Literature Competition of the American Institute of Architects.

FRENCH MANUFACTURERS GLASSWARE AND CERAMIC EXHIBITION

The latest French designs in china, crystal, and ceramics, featuring the current products of leading French manufacturers, will be on display to the trade at the Barbison Plaza Hotel, New York City, from July 21 to 24.

According to the French Commercial Counselor, under whose auspices the exposition will be held, this event marks the first such collection ever assembled in America. The display will include a wide variety of shapes, patterns, and designs inspired by the finest French traditions.

GERMAN GLASS CHAIRMAN DIES

On May 26 Erick Kukat, Chairman of the Board of Glass Works Ruhr, Essen, Germany, and President of the West German Glass Manufacturers Association, died at the age of 60 years in Tegernsee, Bavaria, following a severe illness.

Mr. Kukat's contributions to the post-war Western German glass industry were outstanding and while in America in 1952, he met numerous glassmen.

FOXBORO ESTABLISHES NEW MEXICAN FIRM

Announcing the organization of a Mexicon affiliate, Graficas e Instrumentos, S.A., The Foxboro Company strengthens its international service to users of industrial instruments for measurement and control.

A key link in Foxboro's world-wide network, the new firm, located in Mexico City, has been incorporated for the future manufacture and assembly of instruments and instrument supplies.

BABCOCK & WILCOX OPENS ENGINEERING OFFICE

The third engineering office of The Babcock & Wilcox Company to be located in the State of Florida within the past two years will be opened in Miami, according to Glen J. Schoessow, executive assistant of the company and Chief Engineer at its Barberton, Ohio, plant.

The new office will be in charge of J. E. V. Dingemans and W. H. Barrere, who have been transferred from Barberton.

O-I NAMES REGIONAL SALES MANAGER

Edwin M. Jones, Cincinnati Branch Manager for the Glass Container Division of Owens-Illinois Glass Company, has been promoted to Central Region Sales Manager.

Mr. Jones has appointed Hamer C. Knapper, former Toledoan and Columbus Branch Manager since 1950, as his successor in Cincinnati.

• Dr. Alexander Silverman, Professor of Chemistry, Emeritus, in the University of Pittsburgh, will fly to Europe on July 20 to attend the International Congress of Chemistry in Stockholm and Uppsala, Sweden, July 29 to August 7. Dr. Silverman is Vice President of the Commission on Inorganic Nomenclature of the International Union of Chemistry, chemistry standards body of the world, whose sessions are scheduled concurrently with those of the Congress.

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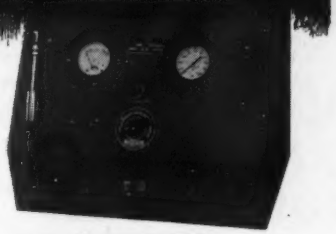

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CHEMICAL HAZARDS . . .
(*Continued from page* 371)

soak in the solvent for more than a few minutes and a little extra elbow grease may be needed.

If carbon tetrachloride must be used, then it must be used under controlled conditions — covered containers for the solvent, used out of doors and not in a confined corner in the maintenance department, and kept under lock and key to prevent unauthorized use and to prevent employees taking some home for a little dry cleaning or spot removal, and the use of a charcoal type respirator when using the solvent. It should be possible to use another solvent such as stoddards solvent (naphtha safety solvent) for preliminary cleaning followed by carbon tet and thus to limit the exposure to carbon tet. Give this solvent the reputation that arsenic has—it is a valuable solvent that can be used safely but it can't be used indiscriminately.

INVENTIONS AND INVENTORS . . .
(*Continued from page* 375)

ings. Assigned to Westinghouse Electric Corporation by Robert W. Wollentin.

An improved luminescent material has been provided containing a zinc borate phosphor which is activated by magnesium chloride in solid solution.

Raw Material Ingredients

ZnO	48.8
H_3BO_3	27.2
Fused $MgCl_2.6H_2O$	2.20
$MnCl_2.4H_2O$	2.26

The raw materials are intimately mixed by Ball-milling or hammer-milling, and fired 1 to 4 hours in open silica containers at about 600° to about 950°C., the lower temperature requiring the longer time. A convenient heat treatment for the above mixture is 2 hours at 910°C. After firing and cooling, the phosphor may be milled to the desired particle size.

This phosphor has an enhanced fluorescent output which is approximately 6% greater than the output of the corresponding phosphor without the magnesium chloride. Magnesium fluoride will act similarly to the chloride and also enhances the fluorescent output of the phosphor.

The patent contains 14 claims and the references cited were: 2,056,545, Varian, Oct. 6, 1936; and 2,310,852, Leverenz, Feb. 9, 1943.

NIAGARA ALKALI APPOINTMENTS

Niagara Alkali Company has announced the appointment of James E. Ferris as Director of Sales and M. F. McCombs as Manager of Chlor-Alkali sales. Both positions are newly-created.

Mr. Ferris, who is past President of the Salesmen's Association of the American Chemical Industry, joined the firm in 1926 and has been in sales since 1931. He is on the Board of Directors of the Compressed Gas Association and the Board of Governors of the Chemical Specialties Manufacturer's Association.

Mr. McCombs came to the company in 1921, and has been in sales since 1923.

GENERAL REFRACTORIES EXECUTIVE CHANGES

General Refractories Company has announced a number of exective changes in top management positions.

Harry T. Graham has been named Vice President. Serving as General Sales Manager until his recent promotion, he will continue to be active in supervision of the sales group, in addition to his new administrative duties. Joining the firm in 1937, Mr. Graham has served as a member of the sales staff, Assistant District Sales Manager at Pittsburgh, and Assistant General Sales Manager. Named to succeed Mr. Graham is Richard E. Longacre.

Also announced is the election of Herbert F. Greene as Vice President. His former position was that of Works Manager. Mr. Greene's long association with General Refractories dates from 1928 when he learned the refractories business through summer employment while completing his education. He studied at Lehigh University and Washington and Jefferson University and has been continuously active in the production end of the firm during the past 25 years. Named to succeed Mr. Greene as Works Manager is Gordon C. Fay.

FERRO ELECTS ADMINISTRATIVE VICE PRESIDENT

C. D. Clawson, President of Ferro Corporation, has announced the appointment of Harry T. Marks as Administrative Vice-President. Mr. Marks moves to the newly-created post from the position of Vice President in Charge of Foreign Operations.

Mr. Marks, Canadian-born, joined the Canadian subsidiary of Ferro Corporation in 1933. He was transferred to Cleveland in 1936 and was sent to Brazil in 1937 where he became Managing Director of Ferro International Division and in 1950 was elected a Vice President in Charge of Foreign Operations.

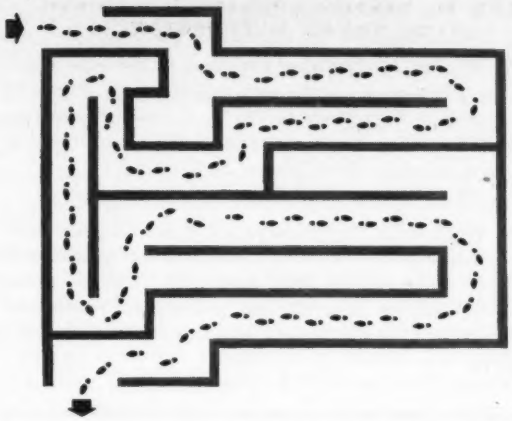
FOOTE MINERAL APPOINTMENTS

Foote Mineral Company has announced the election of John S. Gates as Treasurer, succeeding Gordon H. Chambers who continues as President. Mr. Gates brings to Foote a wide background of industrial and financial experience, gained from a succession of responsible positions with Westinghouse Electric Corporation, the United States Army, the Scott Paper Company, and the Lehigh Coal and Navigation Company.

James E. Castle recently joined the firm as Manager of the Lithium Mining and Milling Division at Kings Mount, North Carolina, it has also been announced. Mr. Castle was formerly Assistant Plant Manager of the Balmat Mill for St. Joseph Lead Company with responsibilities of operations, cost control, personnel relations, and engineering.

Also announced was the appointment of Ernest A. Remesch as Superintendent of the new lithium processing plant at Sunbright, Virginia. A graduate chemist from Ohio State, Mr. Remesch has been associated with E. I. du Pont de Nemours and Melson Fertilizer Company.

Robert J. Longenecker recently joined the firm as a Junior Ceramist in the Research and Development Department. After graduating from Pennsylvania State College in 1951 with a B.S. in Ceramics, Mr. Longenecker worked for Norton Company until joining Foote.



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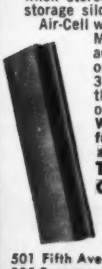

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LEE W. MINTON APPOINTED ADVISOR TO LABOR DELEGATION

Lee W. Minton, International President of the Glass Bottle Blowers Association, AFL, was appointed by President Eisenhower as an advisor to the U. S. labor delegations to the 36th session of the International Labor Organization, held June 4 to 27 in Geneva, Switzerland.

• The Virginia Chapter of Keramos at the Virginia Polytechnic Institute recently held its annual spring initiation ceremony in the campus little chapel. V. V. Kelsey, President of Dominion Minerals, Inc. and a past-President of the American Ceramic Society, was initiated an honorary member.

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ENGINEERING SHORT COURSE OFFERED

The 1953 intensive technical short course to be presented cooperatively next October by the Massachusetts Institute of Technology and the Society of Industrial Packaging and Materials Handling Engineers will offer a wide selection of topics of interest to both junior and senior engineers.

The industrial education program, which attracted more than 800 registrants when it was held last October in Chicago under the co-sponsorship of the University of Illinois, will be conducted simultaneously with the annual Industrial Packaging and Materials Handling Exposition and the National Protective Packaging and Materials Handling Competition. The subject matter of the over-all curriculum will be divided fairly between packaging and materials handling.

NEW CUSHION CONSTRUCTION EMPLOYS GLASS FIBERS

The development of a new cushion construction was recently announced by Down, Inc.

To be known as "Cushionite," the new fabricated unit combines the most desirable features of Vibraglass resilient glass fiber cushioning, a patented product of Glass Fibers, Inc., and foam rubber completely bonded together in various thicknesses and densities to suit individual taste and specifications.

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ORGANIZATIONAL CHANGES AT AMERICAN POTASH & CHEMICAL

W. A. Gale, pioneer executive of The American Potash & Chemical Corporation, is preparing to move from the home office of the plant in Trona, California, where he has spent almost 30 years, to Whittier, California, where he will be in charge of developing and supervising a new research laboratory now nearing completion. As Director of Research, Mr. Gale will continue to supervise over-all policy and program of the Trona laboratory, as well as running the large new installation at Whittier.

Mr. Gale joined the company in November, 1923, shortly after receiving his masters degree in chemistry and metallurgy from the University of British Columbia at Vancouver. He was appointed Director of Research in 1927, following reorganization of the company under its present name.

THATCHER REPRESENTATIVE RETIRES

D. H. Van Horn, well-known representative of the Thatcher Glass Manufacturing Company, Inc., retired on June 1 after 31 years of service with the company.

Mr. Van Horn, who joined Thatcher in 1922, represented the company in the mid-west, particularly in the Chicago area, for 30 years. In May 1946 illness forced him to give up his field work and he took an office job in Thatcher's Streator, Illinois, plant. Following a recurrence of the illness, he has deemed it advisable to retire under the company's Pension Plan.

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